114
35 35 35

Supreme Court, U.S.
FILED
JUL 14 2008
OFFICE OF THE CLERK

Nos. 07-588, 07-589, 07-597 (Consolidated)

In the Supreme Court of the United States

ENTERGY CORP., *Petitioner*,
v.
ENVIRONMENTAL PROTECTION AGENCY, ET AL., *Respondents*.

PSEG FOSSIL LLC AND PSEG NUCLEAR LLC, *Petitioners*,
v.
RIVERKEEPER, INC., ET AL., *Respondents*.

UTILITY WATER ACT GROUP, *Petitioner*,
v.
RIVERKEEPER, INC., ET AL., *Respondents*.

On Writs Of Certiorari To The United States Court Of Appeals For The Second Circuit

JOINT APPENDIX

RICHARD J. LAZARUS
Counsel of Record
GEORGETOWN UNIVERSITY LAW CENTER
600 NEW JERSEY AVE., NW
WASHINGTON, DC 20001
(202) 662-9129
lazarusr@georgetown.edu
Counsel for Respondents Riverkeeper, Inc., et al.

MAUREEN F. MAHONEY
Counsel of Record
PHILIP J. PERRY
J. SCOTT BALLENGER
CASSANDRA S. BERNSTEIN
DREW C. ENSIGN
LATHAM & WATKINS LLP
555 11TH STREET, NW
SUITE 1000
WASHINGTON, DC 20004
(202) 637-2200
maureen.mahoney@lw.com
Counsel for Petitioners PSEG Fossil LLC and PSEG Nuclear LLC

Additional Counsel Listed on Inside Cover

PETITIONS FOR CERTIORARI FILED NOVEMBER 2, 2007
CERTIORARI GRANTED APRIL 14, 2008

GREGORY G. GARRE
ACTING SOLICITOR GENERAL
Counsel of Record
RONALD J. TENPAS
DAVID S. GUALTIERI
CYNTHIA J. MORRIS
JESSICA O'DONNELL
DEPARTMENT OF JUSTICE
WASHINGTON, DC 20530
(202) 51402217
SupremeCtBriefs@USDOJ.gov
Counsel for Federal Respondents

PATRICK C. LYNCH
ATTORNEY GENERAL OF RHODE ISLAND
TRICIA O'HARE JEDELE
SPECIAL ASSISTANT ATTORNEY GENERAL
Counsel of Record
150 SOUTH MAIN STREET
PROVIDENCE, RI 02903
(401) 274-4400, EXT. 2400
tjedele@riag.ri.gov
Counsel for State Respondents

ELISE E. ZOLI
Counsel of Record
KEVIN P. MARTIN
ROBERT H. FITZGERALD
ALADDINE D. JOROFF
KEVIN P. PECHULIS
GOODWIN PROCTER LLP
53 STATE STREET
BOSTON, MA 02109
(617) 570-1000
EZoli@goodwinprocter.com
Counsel for Petitioner Entergy Corp.

KRISTY A. N. BULLEIT
Counsel of Record
HUNTON & WILLIAMS LLP
1900 K STREET, NW
WASHINGTON, DC 20006
(202) 955-1547
kbulleit@hunton.com
Counsel for Petitioner Utility Water Act Group

TABLE OF CONTENTS TO JOINT APPENDIX

United States Court of Appeals for the Second Circuit, Relevant Docket Entries, Case Nos. 04-6692-ag, 04-6693-ag CON, 04-6694-ag CON, 04-9965-ag CON, 04-6696-ag CON, 04-6697-ag CON, 04-6698-ag CON, 04-6699-ag CON JA-1

41 Fed. Reg. 17,387 (Apr. 26, 1976) (preamble) JA-38

In re Brunswick Steam Electric Plant, EPA GCO 41 (June 1, 1976) JA-50

In re Public Service Co. of New Hampshire, et al. (Seabrook Station, Units 1 and 2) National Pollutant Discharge Elimination System Permit, Case No. 76-7, 1 E.A.D. 332, 1977 WL 22370 (EAB June 10, 1977) JA-63

Science Applications International Corp., *Preliminary Regulatory Development Section 316(b) of the Clean Water Act; Background Paper Number 1: Legislative, Regulatory, and Legal History of Section 316(b) and Information on Federal and State Implementation of Cooling Water Intake Structure Technology Requirements* (Apr. 4, 1994) (excerpts) JA-116

EPA, *Economic and Engineering Analyses of the Proposed §316(b) New Facility Rule*, Chapter 11: CWIS Impacts and Potential Benefits, Table 11-1 (Aug. 2000) JA-165

Comments of the New Jersey Department of Environmental Protection regarding Proposed Rule on Cooling Water Intake Structures (New Facilities) (Nov. 9, 2000).... JA-168

David K. Gordon & Reed W. Super, Riverkeeper, et al., Subject Matter Code 10.11 (Comment ID 316bNFR.206.014), *Request for Comment: Dry Cooling–Proposed Option* (Jan. 2, 2002)..... JA-189

E-mail between Chief of the Permits Section, Surface Water Quality Division, Michigan Department of Environmental Quality and EPA regarding 316(b) Burden (Jan. 24, 2002) JA-209

Comment Letter of Frank Ackerman, Global Development and Environment Institute regarding Proposed Rule, RIN 2040-AD62, Clean Water Act of §316(b) – National Pollutant Discharge Elimination System – Proposed Regulations for Cooling Water Intake Structures at Phase II Existing Facilities, EPA 1CR no. 2060.01 (Aug. 1, 2002) JA-211

Comments of California State Water Resources Control Board regarding National Pollutant Discharge Elimination System Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities (Proposed Rule) (Aug. 5, 2002) JA-245

Comments of Atlantic States Marine Fisheries Commission on Cooling Water Intake Structure (Existing Facilities: Phase II) (Aug. 7, 2002) JA-256

Comments of Florida Department of Industrial Wastewater on National Pollutant Discharge Elimination System–Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities (Aug. 7, 2002) JA-260

Comments of New York State Department of Environmental Conservation Office of Natural Resources Regarding the NPDES Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities (Aug. 7, 2002) JA-264

Comment Letter of Frank Ackerman and Rachel Massey, Global Development and Environment Institute, regarding Notice of Data Availability, EPA 40 CFR Part 125, Clean Water Act §316(b) – National Pollutant Discharge Elimination System – Proposed Regulations for Cooling Water Intake Structures at Phase II Existing Facilities; Notice of Data Availability, March 19, 2003 (June 2, 2003) JA-277

Paul E. Reynolds, Hoosier Energy Rural Elect. Co-op, Subject Matter Code 10.07.02 (Comment ID 316bEFR.006.003), *RFC: Appropriateness of "significantly greater"* (Mar. 29, 2004)..... JA-308

Carl Michael Smith, Department of Energy, Subject Matter Code 17.03.02 (Comment ID 316bEFR.010.027), *RFC: EPA rationale to not require closed-cycle* (Mar. 29, 2004)..... JA-311

Carl Michael Smith, Department of Energy, Subject Matter Code 9.0 (Comment ID 316bEFR.010.057), *Costs* (Mar. 29, 2004)..... JA-314

Carl Michael Smith, Department of Energy, Subject Matter Code 9.0 (Comment ID 316bEFR.010.101), *Costs* (Working Draft – May 23, 2002) (Mar. 29, 2004) JA-318

Christine Martin, Pennsylvania Department of Environmental Protection, Subject Matter Code 18.01 (Comment ID 316bEFR.011.004), *RFC: Definition of "adverse environmental impact"* (Mar. 29, 2004) JA-340

Elise N. Zoli, Goodwin Procter Counselors at Law obo Entergy Corporation, Subject Matter Code 9.0 (Comment ID 316bEFR.029.032), *Costs* (Mar. 29, 2004)..... JA-343

Maureen F. Vaskis & Mark F. Strickland, PSEG Services Corp., Office of Environmental Counsel, Subject Matter Code 9.04 (Comment ID 316bEFR.075.057), *Cooling system costs (e.g., dry, wet, recirculating)* (Mar. 29, 2004) JA-345

Doug Dixon & Kent Zammit, EPRI, Subject Matter Code 21.04 (Comment ID 316bEFR.306.116), *Determination of Compliance* (Mar. 29, 2004) JA-352

Basil G. Constantelos, Midwest Generation EME, LLC, Subject Matter Code 6.03 (Comment ID 316bEFR.317.013), *Impacts of CWIS on impaired waterbodies* (Mar. 29, 2004) JA-354

ITEMS PREVIOUSLY REPRODUCED

In accordance with Supreme Court Rule 26.1, the following items have been omitted in printing this joint appendix because they appear on the following pages of the appendix to the Petition for a Writ of Certiorari filed by Entergy Corp. Case No. 07-588) on November 2, 2007:

Opinion of the United States Court of Appeals for the Second Circuit, *Riverkeeper, Inc. v. U.S. EPA*, No. 04-6692-ag(L) and consolidated cases (2d Cir. Jan. 25, 2007) 1a

National Pollutant Discharge Elimination System—Final Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities, 69 Fed. Reg. 41,576 (July 9, 2004) 122a

RELEVANT DOCKET ENTRIES

United States Court of Appeals for the Second Circuit

Lead Docket No : 04-6692 –ag, *consolidated with* Nos. 04-6693-ag CON, 04-6694-ag CON, 04-6695-ag CON, 04-6696-ag CON, 04-6697-ag CON, 04-6698-ag CON, 04-6699-ag CON

Date Filed	Docket Text
12/28/04	Case Docketed: Petition for review of agency order on behalf of PETITIONER Surfrider Foundation, filed. [Entry date Jan 20 2005] [SM]
12/28/04	Copy of EPA decision and order, dated 7/9/04, filed. [Entry date Jan 21 2005] [SM]
12/28/04	Papers from the Ninth Circuit Court Appeals, received. [Entry date Jan 21 2005] [SM]
12/28/04	Certified copy of the Court of Appeals for the Ninth Circuit docket entries FILED. [Entry date Jan 21 2005] [SM]
1/21/05	Served copy of petition under cover letter on respondent. [Entry date Jan 21 2005] [SM]
2/8/05	PETITIONER State of Rhode Island, Form C/A filed, with proof of service. [Entry date Feb 14 2005] [SM]

2/8/05	Non-Binding Statement of Issues, received. [Entry date Feb 14 2005] [SM]
2/14/05	Scheduling order #1 filed. Record or certified list due 7/18/2005. [Entry date Feb 14 2005] [SM]
	* * *
2/16/05	Order vacating scheduling order # 1, filed. [Entry date Feb 16 2005] [SM]
	* * *
2/24/05	Letter, dated 2/23/05 received from Elise N. Zoli informing the Court that [she] is the lead attorney for Entergy Corporation and for all documentation to be sent to the attention of Elise Zoli. [Entry date Feb 28 2005] [SM]
3/1/05	PETITIONER Surfrider Foundation, Form C/A received, with proof of service. [Entry date Mar 2 2005] [SM]
3/1/05	Notice of appeal acknowledgment letter from Reed Super received. [Entry date Mar 2 2005] [SM]
4/1/05	Scheduling order #1 filed. Record or certified list due 5/6/2005. Petitioners brief due 5/13/2005 (10 Copies). Respondents brief due 6/13/2005 (10 Copies). Ready week 7/25/2005. A pre-argument conference is scheduled for Friday, 4/22/05 at 3:00 p.m. (LJG - Staff Counsel). [Entry date Apr 4 2005] [SM]

4/1/05 Pre-Argument Notice and Order from Lisa Greenberg, Filed. Scheduled For: Friday, 4/22/05 at 3:00 p.m. [Entry date Apr 4 2005] [SM]

4/4/05 Petitioner Riverkeeper, Inc. motion to modify briefing schedule, procedure and word limit filed with proof of service. [Entry date Apr 5 2005] [SM]

4/25/05 Record on appeal index in lieu of record filed. [Entry date May 11 2005] [SM]

5/12/05 Scheduling order #2 filed. Petitioners brief service date 6/16/05, filing date 6/17/2005. Intervenor and Amicus Briefs in support of Petitioners service date 7/7/05, filing dated 7/8/05. Respondent EPA's Consolidated Brief service date 10/21/05, filing dated 10/24/05. Petitioner's Supplemental Briefs or Intervenor briefs and Amicus Briefs in support of EPA (if any) service date 11/21/05, filing date 11/22/05. Petitioner's reply brief service date 12/19/05, filing date 12/20/05. Deferred Appendix service date 1/20/06, filing dated 1/23/06. Final Briefs service date 2/22/05, filing dated 2/23/05. [Entry date May 12 2005] [SM]

* * *

5/12/05 Order FILED GRANTING motion to establish briefing schedule and to set procedures for briefing by Petitioner Riverkeeper, Inc., endorsed on motion dated 6/16/2005. (For the Court: AMH,

Motions Staff Attorney) (Before: PWH, C.J.) [Entry date Jun 28 2005] [MA]

6/16/05 Petitioner State of Rhode Island, Petitioner State of Connecticut, Petitioner State of Delaware, et al motion for extension of briefing schedule filed with proof of service. [Entry date Jun 23 2005] [MA]

7/6/05 Scheduling order #3 filed. Ready week 4/24/2006. Petitioners` Opening Briefs due 7/6/2005. Deferred joint appendix due 2/24/2006. Final Briefs filed by 3/28/2006. (See motion order filed this date, granting motion for extension of time, in order to see all the brief due dates.) [Entry date Jul 6 2005] [MA]

7/6/05 PETITIONERS' reply brief due January 24, 2006. [Entry date Jul 6 2005] [MA]

7/6/05 Intervenor and Amicus Briefs in support of Petitioner filed by 7/27/05. [Entry date Jul 6 2005] [MA]

7/6/05 Intervenor and Amicus Briefs in support of EPA filed by, December 13, 2005. [Entry date Jul 6 2005] [MA]

* * *

7/6/05 Order FILED GRANTING motion for extended time by Petitioner State of Rhode Island, Petitioner State of Connecticut, Petitioner State of Delaware, Petitioner State of New

Jersey, Petitioner State of New York, endorsed on motion dated 6/16/2005. "IT IS HEREBY ORDERED that the motion to extend time to file brief (on consent) is GRANTED. The new scheduling order is as follows: Petitioners` Opening Briefs filed by, July 6, 2005. Intervenor and Amicus Briefs in Support of Petitioner filed by, July 27, 2005. Respondent EPA`s consolidated Brief filed by, November 10, 2005. Petitioner`s Supplemental Briefs filed by, December 13, 2005. Intervenor and Amicus Briefs in support of EPA filed by, December 13, 2005. Petitioner`s Reply Briefs filed by, January 24, 2006. Deferred Appendix filed by, February 24, 2006. Final Briefs filed by, March 28, 2006. Appeal to be heard as early as the week of April 24, 2006." (For the Court: AMH, Motions Staff Attorney) (Before: PWH, C.J.) [Entry date Jul 6 2005] [MA]

* * *

7/26/05 Clean Air Task Force brief received. [Entry date Sep 6 2005] [EJ]

7/26/05 MOVANT Clean Air Task Force, motion to file as amicus, received. Problem – no T-1080. [Entry date Sep 6 2005] [EJ]

7/27/05 Movant OMB Watch motion to file brief as amicus curiae, filed with proof of service. [Entry date Aug 11 2005] [DP]

* * *

8/17/05	Order FILED REFERRING motion to file brief as amicus curiae by Movant OMB Watch to the Panel hearing the appeal. (TWY) [Entry date Aug 17 2005] [DP]

* * *

9/9/05	Movant Healthlink, Movant Kentucky Resources Council, et al motion to file brief as amicus curiae, filed with proof of service. [Entry date Oct 13 2005] [DP]

* * *

10/18/05	Order FILED REFERRING motion file brief as amicus curiae to the merits panel by Movant Clean Air Task Force, Movant Healthlink, Movant Kentucky Resources Council, Movant New England Clean Water Action, Movant Ohio Evironmental Council, Movant Ohio Valley Environmental Council. (AH) [Entry date Oct 18 2005] [DP]

* * *

11/14/05	Declaration of Jessica O`Donnell in support of the motion for leave to file corrected certified index to the administrative record, filed with proof of service. [Entry date Dec 8 2005] [DP]
11/14/05	Declaration of Jessica O'Donnell in support of the motion to strike portions of briefs that rely upon material outside of the administrative record, filed with

proof of service. [Entry date Dec 8 2005] [DP]

11/14/05 Respondent United States Environmental Protection Agency motion for leave to correct administrative record index, filed with proof of service. [Entry date Dec 7 2005] [DP]

11/14/05 Respondent United States Environmental Protection Agency motion to strike portions of briefs that rely upon material outside of the administrative record, filed with proof of service. [Entry date Dec 8 2005] [DP]

* * *

12/13/05 AMICUS CURIAE Texas Commission on Environmental Quality, brief filed with proof of service. [Entry date Dec 14 2005] [DP]

* * *

12/13/05 AMICUS CURIAE State of Alabama, State of Indiana, State of Kentucky, State of Nebraska, ET AL, brief filed with proof of service. [Entry date Dec 14 2005] [DP]

* * *

12/13/05 Movant American Petroleum Institute motion for leave to file a brief amicus curiae, filed with proof of service. [Entry date Dec 14 2005] [DP]

* * *

12/14/05 Petitioner PSEG Fossil LLC, Petitioner PSEG Nuclear LLC motion to supplement the Appellate record on appeal, filed with proof of service. [Entry date Dec 15 2005] [DP]

12/14/05 Order FILED GRANTING motion for an extension of time by Petitioner Riverkeeper, Inc., Petitioner Surfrider Foundation. (AH) Response to be filed by December 20, 2005; EPA's reply by January 23, 2006. [Entry date Dec 14 2005] [DP]

12/14/05 Order FILED REFERRING motion to strike portions of briefs that rely upon material outside of the administrative record to the merits panel by Respondent Michael Leavitt, Respondent United States Environmental Protection Agency.(AH) [Entry date Dec 14 2005] [DP]

* * *

12/16/05 Order FILED REFERRING motion to supplement the appellate record on appeal to the merits panel, by Petitioner PSEG Fossil LLC, Petitioner PSEG Nuclear LLC. (AH) [Entry date Dec 16 2005] [DP]

12/20/05 Petitioner, Entergy Corporation's Memorandum in opposition to EPA's motion to strike portions of the briefs that rely upon material outside of the

administrative record, filed with proof of service. [Entry date Dec 27 2005] [DP]

* * *

12/21/05 State Petitioners' brief in support of the motion to supplement the administrative record and for judicial notice, filed with proof of service. [Entry date Dec 27 2005] [DP]

12/21/05 State Petitioners' brief in opposition to EPA's motion to strike portions of State Petitioners' briefs, filed with proof of service. [Entry date Dec 27 2005] [DP]

12/21/05 State Petitioners' brief in opposition to EPA's motion for leave to file corrected certified index of administrative record, filed with proof of service. [Entry date Dec 27 2005] [DP]

12/21/05 Environmental Petitioners' opposition to EPA's motion for leave to file corrected index to the record, filed with proof of service. [Entry date Dec 27 2005] [DP]

12/21/05 Environmental Petitioners' opposition to EPA's motion to strike portions of briefs that rely on material outside of the administrative record, filed with proof of service. [Entry date Dec 27 2005] [DP]

12/21/05 Declaration of Reed W. Super in support of the motion to supplement the record an/or for judicial notice. [Entry date Dec 27 2005] [DP]

12/21/05 Environmental Petitioners motion to supplement record and/or for judicial notice, filed with proof of service. [Entry date Dec 27 2005] [DP]

12/21/05 Petitioner State of Connecticut, Petitioner State of Delaware, Petitioner State of New Jersey, et al motion to supplement appellate record and for Judicial Notice, filed with proof of service. [Entry date Dec 27 2005] [DP]

12/22/05 Petitioners, Utility Water Act Group, Appalahian Power Company and Illinois Energy Association opposing in part to EPA's motion to strike portions of briefs, filed with proof of service. [Entry date Dec 27 2005] [DP]

12/27/05 EPA`s opposition to motion of Petitioner`s PSEG FOSSIL LLC and PSEG NUCLEAR LLC to supplement the appellate record or, in the alternative, for judicial notice, filed with proof of service. [Entry date Dec 28 2005] [DP]

* * *

12/28/05 RESPONDENT United States Environmental Protection Agency, Michael Leavitt, AMENDED certified list of items comprising the record on appeal filed. [Entry date Dec 29 2005] [DP]

12/28/05 Order FILED GRANTING motion for leave to file corrected administrative

record index by Respondent United States Environmental Protection Agency. Before Hon. PWH, C.J., endorsed by AH, Motions Staff Attorney, dated 12/28/05. [Entry date Dec 28 2005] [DP]

* * *

12/30/05 IT IS HEREBY ORDERED that this motion, and any future motions to supplement the record and/or for judicial notice, absent extraordinary circumstances, are referred to the panel that will decide the appeal. Before: Hon. Peter W. Hall, C.J., endorsed by TWY, Motions Staff Attorney, dated 12/30/05. [Entry date Dec 30 2005] [DP]

* * *

1/20/06 IT IS HEREBY ORDERED that the motion for an extension of time is GRANTED to the following extent: The petitioner's reply brief shall be filed on or before February 24,2006; deferred joint appendix due 3/24/2006, briefs in final form shall be filed before April 18, 2006, extended ready week is 5/22/2006. (AH) [Entry date Jan 20 2006] [DP]

1/23/06 Declaration of Jessica O'Donnell in support of the motion for leave to file combined reply brief and opposition to cross-motions, filed with proof of service. [Entry date Jan 25 2006] [DP]

1/23/06	Respondent Michael Leavitt, Respondent United States Environmental Protection Agency motion for leave to file combined reply brief and opposition to cross-motions, filed with proof of service. [Entry date Jan 25 2006] [DP]
1/27/06	Reply of Petitioners PSEG FOSSIL LLC and PSEG NUCLEAR LLC to EPA's Opposition to motion to supplement the appellate record or, in the alternative, for judicial notice, filed with proof of service. [Entry date Jan 30 2006] [DP]

* * *

1/30/06	RESPONDENT United States Environmental Protection Agency, Michael Leavitt, brief in support of their motion to strike (filed 11/14/05) and in opposition to cross-motions to supplement the record (filed on 12/21/05), FILED. [Entry date Feb 9 2006] [DP]
1/30/06	Order FILED GRANTING motion for leave to file combined reply brief and opposition to cross-motions by Respondent United States Environmental Protection Agency, Respondent Michael Leavitt. (AH) [Entry date Jan 30 2006] [DP]
1/30/06	EPA's opposition to Petitioners' cross-motions to supplement the record on appeal, filed with proof of service. [Entry date Jan 30 2006] [DP]

1/30/06 Combined Reply in support of EPA's motion to strike portions of briefs that rely upon material outside of the Administrative record, strike document filed with proof of service. [Entry date Jan 30 2006] [DP]

2/6/06 Reply of Environmental Petitioners to EPA's opposition to motion to supplement the record and/or for judicial notice, filed with proof of service. [Entry date Feb 9 2006] [DP]

* * *

3/3/06 PETITIONER Entergy Corporation, reply brief filed with proof of service. [Entry date Mar 7 2006] [DP]

* * *

3/6/06 It is hereby Ordered that the motion for an extension of time by Petitioner Surfrider Foundation, Petitioner Riverkeeper, Inc., is GRANTED to an including March 3, 2006. (AH) Extended Ready week is 5/22/2006. [Entry date Mar 6 2006] [DP]

* * *

3/28/06 Joint appendix received. PETITIONER Riverkeeper, Inc., Surfrider Foundation (Vol 7) [Entry date Mar 29 2006] [DP]

3/28/06 Petitioner PETITIONER Riverkeeper, Inc., Surfrider Foundation, special

appendix received. (vol 2) [Entry date Mar 29 2006] [DP]

3/28/06 PETITIONER Riverkeeper, Inc., Surfrider Foundation, supplemental joint appendix received. (vol 2) [Entry date Mar 29 2006] [DP]

3/28/06 PETITIONER Riverkeeper, Inc., Surfrider Foundation, joint appendix filed w/pfs. (vol 7) [Entry date Mar 29 2006] [DP]

3/28/06 Petitioner PETITIONER Riverkeeper, Inc., Surfrider Foundation, special appendix filed (w/pfs) (vol 2) [Entry date Mar 29 2006] [DP]

4/6/06 Stipulation to amend caption RECEIVED. [Entry date Apr 6 2006] [DP]

4/11/06 Set for argument on 6/8/06. [Entry date Apr 11 2006] [AV]

* * *

4/19/06 Environmental Petitioners 28(J) letter FILED. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER State of Connecticut, State of Delaware, State of New Jersey, State of New York, ET AL, brief in final form with proof of service filed. Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER Appalachian Power Company, Illinois Energy Association,

brief in final form with proof of service filed. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER PSEG Fossil LLC, PSEG Nuclear LLC, brief in final form with proof of service filed. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER Entergy Corporation, brief in final form with proof of service filed. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER Riverkeeper, Inc., Surfrider Foundation, brief in final form with proof of service filed. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER PSEG Fossil LLC, PSEG Nuclear LLC, supplemental brief (FF) filed with proof of service. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER Entergy Corporation, supplemental brief (FF) filed with proof of service. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER Appalachian Power Company, Illinois Energy Association, supplemental brief (FF) filed with proof of service. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER State of Connecticut, State of Delaware, State of New Jersey, State of New York, ET AL, supplemental brief (FF) filed with proof

of service. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER Riverkeeper, Inc., Surfrider Foundation, supplemental brief (FF) filed with proof of service. [Entry date Apr 19 2006] [DP]

4/19/06 Notice of Errata regarding the Final Brief for Respondents received. [Entry date Apr 19 2006] [DP]

4/19/06 RESPONDENT United States Environmental Protection Agency, Michael Leavitt, brief in final form with proof of service filed. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER Riverkeeper, Inc., Surfrider Foundation, reply brief (FF) filed with proof of service. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER Appalachian Power Company, reply brief (FF) filed with proof of service. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER State of Connecticut, State of Delaware, State of New Jersey, State of New York, ET AL, reply brief filed (FF) with proof of service. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER PSEG Fossil LLC, PSEG Nuclear LLC, reply brief filed with proof

of service. [Entry date Apr 19 2006] [DP]

4/19/06 PETITIONER Entergy Corporation, reply brief filed with proof of service. [Entry date Apr 19 2006] [DP]

4/19/06 Letter received from PSEG FOSSIL LLC and PSEG nuclear LLC regarding non-substantive changes to citation designations in their final brief, dated 4/17/06. [Entry date Apr 19 2006] [DP]

4/19/06 State of Illinois brief in support of Environmental and State Petitioners, filed with proof of service. [Entry date Apr 26 2006] [DP]

5/1/06 Letter received from Environmental Petitioners requesting a 10-minute expansion of the time allotted for oral argument, dated 4/27/06. [Entry date May 1 2006] [DP]

* * *

5/3/06 Letter received from James Christman in response of Industry Petitioners Utility Water Act Group, Appalachian Power Company, and Illinois Energy Association, Entergy Corp., PSEG Fossil LLC and PSEG Nuclear LLC to the request for additional time for oral argument from Riverkeeper, Inc, dated 5/2/06. [Entry date May 3 2006] [DP]

5/4/06	ENVIRONMENTAL PETITIONERS, 28(J) letter FILED, dated 5/3/06. [Entry date May 5 2006] [DP]
5/5/06	Letter received from State Petitioners requesting that the Court grant State Petitioners a proportionally equal share of time for oral argument, dated 5/3/06. [Entry date May 8 2006] [DP]
5/5/06	Letter received from Respondent, stating that EPA does not take any position as to whether the Court should grant any pending requests for additional oral argument time. If the Court were to deny all of the Petitioner's requests, EPA asks the Court to expand EPA's time for oral argument so the EPA's time is equal to the Petitioner's total time under the current allotment. On the other hand, if the Court grants Petitioner's requests for more oral argument time, EPA asks the Court to give EPA the same total of minutes for argument as the expanded total number of minutes granted to Petitioners. Letter dated 5/4/06. [Entry date May 11 2006] [DP]

* * *

5/11/06	Non-dispositive stipulation to amend caption, FILED. [Entry date May 11 2006] [AV]
5/11/06	The CAPTION PAGE for this appeal has been AMENDED as per stipulation

dated 5/11/06. [Entry date May 11 2006] [DP]

5/23/06 Order filed stating: "The panel will reserve decision on all motions to strike portions of the record or briefs, or to supplement the record, until such time as we issue our decision on the merits of the case. FOR THE COURT: Roseann B. MacKechnie, Clerk of Court." [Entry date May 23 2006] [PC]

* * *

6/1/06 Letter received from Karl Lytz and Kristy Bulleit, attorneys for Utility Water Act Group, Appalachian Power Company, Illiniois Energy Association, PSEG Fossil LLC and PSEG Nuclear LLC request that they each be allowed to reserve eight minutes of argument time, dated 5/31/06. [Entry date Jun 2 2006] [DP]

6/5/06 Notice to counsel regarding letter dated May 31, 2006 by Kristy A.N. Bulleit, counself for UWAG, requesting that each party be allowed to reserve eight minutes of argument time, has been DENIED. [Entry date Jun 5 2006] [AG]

* * *

6/8/06 Case heard before: STRAUB, SOTOMAYOR, HALL, CJJ. [Entry date Jun 8 2006] [SC]

* * *

6/23/06	PETITIONER Entergy Corporation, 28(J) letter FILED. [Entry date Jun 26 2006] [DP]
6/26/06	ENVIRONMENTAL PETITIONERS, 28(J) letter FILED. [Entry date Jun 27 2006] [DP]
6/26/06	RESPONDENT United States Environmental Protection Agency, Michael Leavitt, post argument letter brief filed, dated 6/23/06. [Entry date Jun 27 2006] [DP]
	* * *
8/1/06	Letter received from Petitioner, State of Rhode Island, dated 7/31/06. [Entry date Aug 2 2006] [DP]
8/14/06	Letter received from Cynthia Morris, Counsel for EPA, requesting for the Court to disregard the States` letter in its entirety, dated 8/11/06. [Entry date Aug 14 2006] [DP]
8/14/06	Letter received from James Christman, counsel for UWAG, Appalachian Power Company, and Illinois Energy Association, requesting that the Court disregard the States' letter, dated 8/11/06. [Entry date Aug 14 2006] [DP]
1/25/07	Notice to counsel in re: Opinion filed on 01/25/2007. [Entry date Jan 25 2007] [YS]

1/25/07	Judgment filed. [Entry date Jan 31 2007] [YS]
1/25/07	Petitions are GRANTED in part and DENIED in part and DISMISSED as to one aspect of the petitions for lack of jurisdiction because their is no final agency action to review, by published signed opinion filed. (SS) [Entry date Jul 25 2007] [LY]
2/5/07	Letter received from Reed Super, Counsel for Environmental Petitioners advising the court of the typographical errors in the decision issued on 01/25/2007. [Entry date Feb 6 2007] [YS]

* * *

2/14/07	Errata sheet re: Page 2195 Line 2, 4, Page 8215 First full paragraph line 3, Page 8224 first full paragraph, line 1, Page 8249 first paragraph, line 16, filed. [Entry date Feb 14 2007] [YS]
2/14/07	Notice to counsel in re: Errata sheet filed. [Entry date Feb 14 2007] [YS]
2/28/07	Respondent Michael Leavitt, Respondent United States Environmental Protection Agency motion extended time to file Petition for Rehearing/ Rehearing En Banc, filed with proof of service. [Entry date Mar 5 2007] [YS]

3/9/07 Petitioner Riverkeeper, Inc., Petitioner Surfrider Foundation motion for briefing schedule for attorney's fee Application filed with proof of service. [Entry date Mar 9 2007] [MR]

* * *

3/13/07 Order FILED GRANTING motion extended time by Respondent Michael Leavitt, Respondent United States Environmental Protection Agency, to file petition for rehearing/rehearing en banc to 04/26/2007, endorsed on motion dated 3/9/2007. (Before Hon. CJS., SS., PWH., C.J. by AH) [Entry date Mar 13 2007] [YS]

3/14/07 Order FILED GRANTING motion file brief as amicus curiae by Movant OMB Watch, in light of Opinion filed. [Entry date Mar 14 2007] [YS]

3/14/07 Order FILED GRANTING motion file brief as amicus curiae by Movant Healthlink, Movant Clean Air Task Force, Movant Kentucky Resources Council, Movant New England Clean Water Action, Movant Ohio Environmental Council, Movant Ohio Valley Environmental Council, in light of opinion filed. [Entry date Mar 14 2007] [YS]

3/14/07 Order FILED GRANTING motion file brief as amicus curiae by Movant American Petroleum Institute, in light of

opinion filed. [Entry date Mar 14 2007] YS]

3/15/07 Order FILED DENYING motion strike document by Respondent Michael Leavitt, Respondent United States Environmental Protection Agency, as Moot in light of Opinion filed. [Entry date Mar 15 2007] [YS]

3/15/07 Order FILED DENYING motion supplement record on appeal by Petitioner PSEG Fossil LLC, Petitioner PSEG Nuclear LLCM, as MOOT in light of Opinion filed. [Entry date Mar 15 2007] [YS]

3/15/07 Order FILED DENYING motion supplement record on appeal by Petitioner American Littoral Society, as MOOT in light of Opinion filed. [Entry date Mar 15 2007] [YS]

3/15/07 Order FILED DENYING motion supplement record on appeal by Petitioner State of New Jersey, Petitioner State of New York, Petitioner State of Connecticut, Petitioner American Littoral Society, Petitioner State of Rhode Island, Petitioner State of Delaware, Petitioner Commonwealth of Massachusetts, as MOOT in light of Opinion filed. [Entry date Mar 15 2007] [YS]

* * *

3/19/07 Order FILED GRANTING motion to set briefing schedule for attorney`s fees by Petitioner Riverkeeper, Inc., Petitioner Surfrider Foundation. Schedule requested will be set after rehearing deadlines have expired, endorsed on motion dated 3/9/2007. (Before Hon. CJS., SS., PWH., C.J. by AH) [Entry date Mar 19 2007] [YS]

4/17/07 Petitioner Appalachian Power Company for extension of time until May 14, 2007, to file Petition for Rehearing and Rehearing En Banc, filed with proof of service. [Entry date Apr 17 2007] [YS]

4/20/07 Notice from Supreme Court granting FILERS extension of time in which to file a writ of certiorari received to and including 05/25/2007. [Entry date Apr 20 2007] [YS]

* * *

4/24/07 Order FILED GRANTING motion extended time by Petitioner Appalachian Power Company, endorsed on motion dated 4/17/2007. Extended Petition for rehearing is 5/14/2007. (Before Hon. CJS., SS., PWH., C.J. by AH) [Entry date Apr 24 2007] [YS]

5/14/07 Petitioner, Utility Water Act Group, PSEG Fossil LLC, Petitioner PSEG Nuclear LLC motion Petition for rehearing and petition for rehearing en

banc filed with proof of service. [Entry date May 15 2007] [YS]

5/14/07 Petitioner Entergy Corporation Petition for rehearing and petition for rehearing en banc filed with proof of service. [Entry date May 15 2007] [YS]

* * *

7/5/07 Order FILED DENYING Petition for rehearing Docket as of June 02, 2008 11:08 am and petition for rehearing en banc by Petitioner PSEG Fossil LLC, Petitioner PSEG Nuclear LLC. [Entry date Jul 5 2007] [YS]

7/5/07 Order FILED DENYING Petition for rehearing and petition for rehearing en banc by Petitioner Entergy Corporation. [Entry date Jul 5 2007] [YS]

7/17/07 Judgment MANDATE ISSUED. CLOSED [Entry date Jul 17 2007] [YS]

7/24/07 Letter sent to district court recalling mandate. [Entry date Jul 24 2007] [YS]

* * *

7/24/07 Order filed stating: Petitioner's motion for attorneys' fees shall be filed on or before January 5, 2008; the respondent shall file its opposition on or before February 5, 2008; petitioner's reply papers shall be filed on or before February 26, 2008. (By AH) [Entry date Jul 24 2007] [YS]

* * *

9/27/07	Notice from Supreme Court granting extension of time in which to file a writ of certiorari received to and including November 2, 2007. [Entry date Sep 28 2007] [YS]

* * *

11/8/07	Notice of filing petition for Utility Water Act Group dated 11/02/2007 filed. Supreme Court #: 07-597. [Entry date Nov 9 2007] [YS]
11/9/07	Notice of filing petition for PETITIONER PSEG Fossil LLC, PSEG Nuclear LLC, dated 11/02/2007 filed. Supreme Court #: 07-589. [Entry date Nov 9 2007] [YS]
11/9/07	Notice of filing petition for PETITIONER Entergy Corporation, dated 11/02/2007 filed. Supreme Court #: 07-588. [Entry date Nov 13 2007] [YS]
11/15/07	Petitioner Riverkeeper, Inc., Petitioner Surfrider Foundation motion for extension of time to file attorneys' fees with 30 days for response and 21 days for reply and continuing to defer issuance of mandate until fee application is resolved, filed with proof of service. [Entry date Nov 16 2007] [YS]
11/27/07	Notice to counsel regarding Court's Order dated 11/27/07 granting the Petitioner's motion for an extension of

time to file motion for Attorney's fees and to defer the issuance of the mandate until dee application is resolved. [Entry date Nov 27 2007] [JR]

11/27/07 Order FILED GRANTING motion an extension of time to file motion for Attorney`s fees & to defer issuance of mandate by Petitioner Riverkeeper, Inc., Petitioner Surfrider Foundation, endorsed on motion dated 11/15/2007. IT IS HEREBY ORDERED that Petitioner`s motion for extension of time to file motion for Attorney`s fees and to defer issuance of mandate until fee application is resolved is GRANTED. Before: CJS SS & PWH, CJJ. (JP) [Entry date Nov 27 2007] [JR]

* * *

4/17/08 Letter dated 04/17/2008 from the Supreme Court advising of order GRANTING petition for writ of certiorari by PETITIONERS, filed. (Supreme Court # 07-597) [Entry date Apr 18 2008] [YS]

4/17/08 Writ of Certiorari GRANTED. [Entry date Apr 18 2008] [YS]

4/18/08 Reinstatement filed in light of Supreme Court Letter received Granting Writ of Cert, FILED. Reinstatement Code: M. [Entry date Apr 18 2008] [YS]

5/14/08	Petitioner Riverkeeper, Inc., Petitioner Surfrider Foundation motion for 1. new briefing schedule for motion for award of attorneys' fees and costs pursuant to Clean Water Act Sec 509(b)(3) and 2. hold of mandate until fee application is resolved. Fee motion would be due 120 days after Supreme Court decision in this case with 30 days for opposition and 21 days for reply, filed with proof of service. [Entry date May 15 2008] [YS]
	* * *
5/27/08	IT IS HEREBY ORDERED that Petitioner's motion for extension of time and for an award of attorneys` fees/costs until 120 days after the Supreme Court issues its decision: and to defer issuance of mandate until fee application is resolved is GRANTED. (Before Hon. CJS., SS., PWH., CJJ., by JP) [Entry date May 27 2008] [YS]
	* * *

United States Court of Appeals
for the Second Circuit

Non-Duplicative Relevant Docket Entries for
Docket No. 04-6693-ag

Date Filed	Docket Text
12/28/04	Case Docketed: Petition for review of agency order on behalf of PETITIONER Commonwealth of Massachusetts, State of Connecticut, State of Delaware, State of New Jersey, ET AL, filed. [Entry date Jan 21 2005] [SM]
	* * *
12/28/04	Papers from the First Circuit Court of Appeals, received. [Entry date Jan 21 2005] [SM]
12/28/04	Certified copy of the Court of Appeals for the First Circuit docket entries FILED. [Entry date Jan 21 2005] [SM]
	* * *
2/4/05	Notice of appeal acknowledgment letter from FILERS State of Delaware received. [Entry date Feb 9 2005] [SM]
2/8/05	Notice of appeal acknowledgment letter from FILERS State of Rhode Island received. [Entry date Feb 14 2005] [SM]
2/8/05	Notice of appeal acknowledgment letter from FILERS Commonwealth of

	Massachusetts received. [Entry date Feb 14 2005] [SM]
2/8/05	Notice of appeal acknowledgment letter from FILERS The State of Connecticut received. [Entry date Feb 14 2005] [SM]
2/8/05	Notice of appeal acknowledgment letter from FILERS The State of New Jersey received. [Entry date Feb 14 2005] [SM]

* * *

United States Court of Appeals
for the Second Circuit

Non-Duplicative Relevant Docket Entries for
Docket No. 04-6694-ag

Date Filed	Docket Text
12/28/04	Case Docketed: Petition for review of agency order on behalf of PETITIONER Appalachian Power Company, filed. [Entry date Jan 21 2005] [SM]
	* * *
12/28/04	Papers from United States Court of Appeals for the Fourth Circuit, received. [Entry date Jan 21 2005] [SM]
12/28/04	Certified copy of the United States Court of Appeals for the Fourth Circuit docket entries FILED. [Entry date Jan 21 2005] [SM]
	* * *
2/18/05	Notice of appeal acknowledgment letter from James N. Christman, attorney for Appalachian Power Company FILERS received. [Entry date Feb 22 2005] [SM]
2/18/05	PETITIONER Appalachian Power Company, Form C/A filed, with proof of service. [Entry date Feb 22 2005] [SM]
	* * *

United States Court of Appeals
for the Second Circuit

Non-Duplicative Relevant Docket Entries for
Docket No. 04-6695-ag

Date Filed	Docket Text
12/28/04	Case Docketed: Petition for review of agency order on behalf of PETITIONER Utility Water Act Group, filed. [Entry date Jan 21 2005] [SM]
	* * *
12/28/04	Papers from the United States Court of Appeals for the Second Circuit, received. [Entry date Jan 21 2005] [SM]
12/28/04	Certified copy of the Court of Appeals for the Second Circuit docket entries FILED. [Entry date Jan 21 2005] [SM]
	* * *
2/14/05	Notice to counsel re: Amended Caption and docket sheet. [Entry date Feb 14 2005] [SM]
3/8/05	Notice of appeal acknowledgment letter from Kristy A.N. Bulleit received. [Entry date Mar 10 2005] [SM]
3/8/05	PETITIONER Utility Water Act Group, Form C/A received, with proof of service. [Entry date Mar 10 2005] [SM]

3/8/05	Letter, dated 3/4/05 received from Kristy A.N. Bulleit stating the enclosure of the Acknowledgement letter and Form C-A. [Entry date Mar 10 2005] [SM]

* * *

United States Court of Appeals
for the Second Circuit

Non-Duplicative Relevant Docket Entries for
Docket No. 04-6696-ag

Date Filed	Docket Text
12/28/04	Case Docketed: Petition for review of agency order on behalf of PETITIONER PSEG Fossil LLC, filed. [Entry date Jan 21 2005] [SM]
	* * *
12/28/04	Papers from The United States Court of Appeals for the District of Columbia Circuit, received. [Entry date Jan 21 2005] [SM]
12/28/04	Certified copy of the United States Court of Appeals for the District of Columbia Circuit docket entries FILED. [Entry date Jan 21 2005] [SM]
	* * *
2/16/05	Notice of appeal acknowledgment letter from PSEG Fossil LLC and PSEG Nuclear LLC FILERS received. [Entry date Feb 22 2005] [SM]
2/16/05	PETITIONER PSEG Fossil LLC, PSEG Nuclear LLC, Form C/A filed, with proof of service. [Entry date Feb 22 2005] [SM]
	* * *

United States Court of Appeals
for the Second Circuit

Non-Duplicative Relevant Docket Entries for
Docket No. 04-6697-ag

Date Filed	Docket Text
12/28/04	Case Docketed: Petition for review of agency order on behalf of PETITIONER Entergy Corporation, filed. [Entry date Jan 21 2005] [SM]
	* * *
12/28/04	Papers from the United States Court of Appeals for the Fifth Circuit, received. [Entry date Jan 21 2005] [SM]
12/28/04	Certified copy of the United States Court of Appeals for the Fifth Circuit docket entries FILED. [Entry date Jan 21 2005] [SM]
	* * *
2/15/05	Notice of appeal acknowledgment letter from Entergy Corperation FILERS received. [Entry date Feb 22 2005] [SM]
2/15/05	PETITIONER Entergy Corporation, Form C/A filed, with proof of service. [Entry date Feb 22 2005] [SM]
	* * *

United States Court of Appeals
for the Second Circuit

Non-Duplicative Relevant Docket Entries for
Docket No. 04-6698-ag

Date Filed	Docket Text
12/28/04	Case Docketed: Petition for review of agency order on behalf of PETITIONER Illinois Energy Association, filed. [Entry date Jan 21 2005] [SM]
	* * *
12/28/04	Papers from the United States Court of Appeals for the Seventh Circuit PETITIONER, received. [Entry date Jan 21 2005] [SM]
12/28/04	Certified copy of the United States Court of Appeals for the Seventh Circuit docket entries FILED. [Entry date Jan 21 2005] [SM]
2/18/05	Notice of appeal acknowledgment letter from James N. Christman, attorney for Illinois Energy Association, FILERS received. [Entry date Feb 22 2005] [SM]
2/18/05	PETITIONER Illinois Energy Association, Form C/A filed, with proof of service. [Entry date Feb 22 2005] [SM]
	* * *

United States Court of Appeals
for the Second Circuit

Non-Duplicative Relevant Docket Entries for
Docket No. 04-6699-ag

Date Filed	Docket Text
12/28/04	Case Docketed: Petition for review of agency order on behalf of PETITIONER Riverkeeper, Inc., filed. [Entry date Jan 21 2005] [SM]
	* * *
12/28/04	Papers from The United States Court of Appeals for the Second Circuit, received. [Entry date Jan 21 2005] [SM]
12/28/04	Certified copy of the United States Court of Appeals for the Second Circuit docket entries FILED. [Entry date Jan 21 2005] [SM]
12/28/04	Note PRIOR case number: 04-4059-ag. [Entry date Jan 26 2005] [SM]
	* * *
3/1/05	Notice of appeal acknowledgment letter from Reed Super FILERS received. [Entry date Mar 2 2005] [SM]
	* * *

41 FEDERAL REGISTER 17,387 (April 26, 1976)

Title 40—Protection of the Environment

CHAPTER 1—ENVIRONMENTAL PROTECTION AGENCY

[FRL 528-6]

PART 401—GENERAL PROVISIONS

PART 402—BEST TECHNOLOGY AVAILABLE FOR THE LOCATION, DESIGN, CONSTRUCTION, AND CAPACITY OF COOLING WATER INTAKE STRUCTURES FOR MINIMIZING ADVERSE ENVIRONMENTAL IMPACT

On December 13, 1973 notice was published in the FEDERAL REGISTER (38 FR 34410), that the Environmental Protection Agency (EPA or Agency) was proposing regulations concerning determinations to insure that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

The purpose of this notice is to establish final regulations regarding cooling water intake structures by amending 40 CFR Chapter I, Subchapter N, Part 401 and by adding a new Part 402. This final rulemaking is promulgated pursuant to sections 301, 306, 316(b) and 501(a) of the Federal Water Pollution Control Act, as amended, (the Act); 33 U.S.C. 1311, 1316, 1326(b) and 1261(a); 86 Stat. 816 et seq.; Pub.L. 92-500.

Section 316(b) of the Act requires that "any standard established pursuant to section 301 or section 306 of this Act and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact."

The regulations set forth below amend 40 CFR Part 401 (General Provisions) and establish a new part 402. The General Provisions set forth in Part 401 were published on February 4, 1974 (39 FR 4532).

Section 401.14, which is added to Part 401 by these regulations, provides that the location, design, construction and capacity of cooling water intake structures for any point source for which a standard is established pursuant to section 301 or 306 shall reflect the best technology available for minimizing adverse environmental impact in accordance with the provisions of Part 402.

Section 402.10 establishes the applicability of the provisions of Part 402. Section 402.11 provides definitions for several of the significant statutory terms which appear in Section 316(b) of the Act.

Section 402.12 provides that the information contained in the Development Document accompanying these regulations is to be used in determining compliance with the statutory standard.

The regulations as proposed were supported by a document entitled "Development Document for Proposed Best Technology Available for Minimizing Adverse Environmental Impact of Cooling Water Intake Structures." (December, 1973). This document was made available to the public and circulated to

interested persons at approximately the time of publication of the notice of proposed rulemaking.

Interested persons were invited to participate in the rulemaking by submitting written comments within 30 days from the date of publication. Because of delays in the printing of the supporting Development Document beyond the Agency's control, the period for public comment was extended an additional 90 days in order to afford a full opportunity to interested parties to participate fully in the rulemaking process (39 FR 4487). Prior public participation in the form of solicited comments and responses from the States, Federal agencies, and other interested parties were described in the preamble to the proposed regulation. The EPA has considered carefully all of the comments received and a discussion of these comments with the Agency's response thereto follows.

(a) Summary of Major Comments.

The following responded to the request for written comments which was contained in the preamble to the proposed regulations: Natural Resources Defense Council, Inc.; Duke Power Company; Shell Oil Company; Manufacturing Chemists Association; United States Atomic Energy Commission; United States Department of the Interior; Quirk, Lawler and Matusky Engineers; Indianapolis Power and Light Company; New York State Department of Environmental Conservation; State of Michigan Department of Natural Resources; National Oceanic and Atmospheric Administration; Tennessee Valley Authority; State of California–State Water Resources Control Board; Commonwealth Edison Company; Texas Electric Service Company; Consolidated Edison Company of New York, Inc.; Salt River Project; Otter

Tail Power Company State of New York Public Service Commission; Illinois Power Company; The Great Western Sugar Company; Edison Electric Institute; State of New Hampshire Fish and Game Department; Union Carbide Corporation; Texaco, Inc.; Mobil Oil Corporation; New York Power Pool; United States Department of Health, Education, and Welfare; Colorado Department of Public Health; Texaco, Inc.; Northern Indiana Public Service Company; New England Power Company; State of New York Department of Law; Debevoise and Liberman. The following is a summary of the significant comments and the Agency's response to those comments.

(1) Several commenters recommended that the regulations provide that the "best technology available" be determined on the basis of an assessment of the cost of applying a particular technology in relation to the benefits to be attained.

No comparison of monetary costs with the social benefits of minimizing adverse environmental impacts, much less a formal, quantified "cost/benefit" assessment is required by the terms of the Act. The statute directs the Agency to insure that enumerated aspects of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts. Once such adverse effects have been identified (or, in the case of new structures, predicted) then the effort must be to select the most effective means of minimizing (i.e., "reducing to the smallest possible amount or degree") those adverse effects. The brief legislative history of section 316(b) states that the term "best technology available" contemplates the best technology available commercially at an economically practicable cost. As

with the statute, this language does not require a formal or informal "cost/benefit" assessment. Rather, the term "available commercially at an economically practicable cost" reflects a Congressional concern that the application of "best technology available" should not impose an impracticable and unbearable economic burden on the operation of any plant subject to section 316(b). Since the regulations require a case-by-case determination of the best available technology, consideration of the economic practicability of installing that technology must necessarily be conducted on a similarly individualized basis.

(2) Several commenters recommended that the Development Document include specific consideration of the age of facilities and other pertinent factors which bear upon the degree to which costs are reasonable for particular establishments. Others suggested that the Agency explicitly distinguish among the types of technology considered the best available on the basis of the nature of the water body on which the plant is located and the percentage of flow withdrawn.

Section 316(b) requires "that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." Decisions relating to the best technology available are to be made on a case-by-case basis and may include factors such as age. The Development Document for Cooling Water, Intake Structures contains information to be used in determining the best technology available. The Development Document accompanying effluent limitations and new source performance standards for particular industrial categories may be referred to for other factors specific to point sources within that

category which may be relevant to consideration of economic practicability. The potential for adverse environmental effects associated with cooling water systems may depend upon such factors as size and type of water body and relative magnitude of flow withdrawn for cooling. The Agency expects such factors to be considered in determining the appropriate cooling water technology.

(3) Several commenters recommended that the construction technology information be deleted from the Development Document because its consideration by EPA would duplicate the actions of the U.S. Army Corps of Engineers.

The regulations of the Corps of Engineers primarily relate to hazards to navigation. The data in the Development Document concerning construction technology address factors related to "minimizing adverse environmental impact" of cooling water intake structures and therefore supplement rather than duplicate the actions of the Corps of Engineers.

(4) Some commenters recommended that the Agency identify closed cycle or recirculating cooling systems as the best technology available for minimizing adverse environmental impact. Others recommended that, at least for steam electric powerplants located in estuaries and biologically important coastal areas the "best technology available" is closed cycle cooling, since minimization of cooling water intake capacity (volume of flow) is the most practical currently available means for minimizing mortality of marine species in passage through the internal cooling systems of these plants.

The Agency does not believe that closed cycle cooling systems are universally and necessarily the best technology available despite their undoubted and

dramatic reduction in rates of water used. While the extent of entrainment and impingement damage is in many cases correlated with the amount of water withdrawn, the Agency believes that the appropriate technology is best determined after a careful evaluation of the specific aspects at each site. Moreover, because of the substantial cost of conversion to closed cycle cooling systems, its economic practicability will depend upon considerations relating to individual industrial plants which are, again, most effectively analyzed on a case by case basis.

While there is substantial evidence for concern about the potential destructive effects of open-cycle cooling systems on powerplants in biologically sensitive areas such as estuaries, the available data corresponding to certain of these plants do not support a blanket requirement that all similarly situated plants reduce the capacity of their intake structures so as to require conversion to recirculating cooling systems.

(5) One commenter observed that the cost of modifying an existing intake structure to comply with certain specifications will generally exceed the cost of designing and constructing a new intake structure to those standards. On this basis, it is urged that the Agency expressly provide that an existing structure which has minimal environmental impact "reflects" the "best technology" regardless of whether its design, location and capacity conform precisely to the related criteria set forth in the Development Document.

The Agency recognizes that the cost of modification to existing structures may exceed that of constructing a new intake structure to comparable standards. The Agency expects that higher costs associated with "retrofitting" existing structures, as well as the

relationship of those costs to the remaining expected useful life of the facility, will be taken into account in determining the extent to which the specific technological measures described in the Development Document are available at an "economically practicable cost."

(6) Some commenters recommended that the Development Document should provide that the proper test for minimizing adverse environmental impact is related to damage to the aquatic ecosystem and not to the number of fish and other aquatic organisms killed or damaged.

Section 316(b) requires that the best technology available be used to minimize adverse environmental impacts. As noted in the Development Document, there are many factors that should be considered when determining whether an adverse environmental impact exists or is likely to exist. The factors noted by the commenters are among those to be considered. All pertinent factors, rather than reliance on a single factor, should receive adequate consideration.

(7) Some commenters recommended that the regulations should not establish nationally uniform deadlines for compliance.

Inasmuch as the available technologies of cooling water intake structures for minimizing adverse environmental impact, as well as effluent thermal control system characteristics governed by section 316(a) of the Act, are closely related to the capacity (volume of flow) and other features of the cooling water intake system, the practicable implementation of requirements concerning intake structures and effluent heat should consider both requirements. Therefore, compliance dates should be determined on a case-by-

case basis taking into consideration any compliance dates for limitations on the discharge of heated effluent and other pertinent factors.

(8) Some commenters recommended that the regulations should refer independently to entrainment damage or that the Development Document should be enlarged to cover harm from entrainment. A countervening recommendation submitted by some commenters was that the regulations apply only to the physical intake structures themselves and not to entrainment damage within other parts of the cooling system.

The terms of the Act and the legislative history related to section 316(b) indicate that the best technology available for cooling water intake structures be used for minimizing any adverse environmental impact. The Development Document has been enlarged to include factors relating to the entrainment problem which, as commenters noted, is of environmental concern, and which realistically cannot be separated from intake structure capacity or location.

(9) A commenter recommended that the time period be identified over which the percentage of flow atributable to cooling is to be calculated.

The definition of the term "cooling water intake structure" indicates that the major portion of the water directed through the structure is to absorb waste heat. An adequate period of time should be used to minimize short term water use variations. This period of time should be at least twelve months, except where shorter periods are warranted.

(10) One commenter criticized the omission of energy penalties associated with operation of some closed cycle cooling systems and suggested that the

Agency should address this cost as well as the capital costs of construction.

The Agency has undertaken an economic analysis of the regulations in response to this comment and in order to assess the potential economic effects of installing the best available cooling water technology on intake structures at electric powerplants—which are the largest industrial users of cooling water. This analysis addresses the energy and capacity loss costs of closed cycle cooling, assuming that these systems were to be required. The analysis is necessarily tentative since the regulations do not attempt to establish rigid rules governing the selection of best technology available. Nevertheless, the analysis indicates that even under conservative assumptions of the number of plants affected, the increase in energy (fuel) consumption is less than one half of one percent of total fuel consumption by the power industry.

(11) It was suggested that the information and data collection requirements for the intake structure determinations under section 316(b) be coordinated with those of section 316(a) which addresses the environmental effects of heat in the discharge of cooling water.

The Agency agrees that duplication in the collection of biological and hydrological data should be avoided. To the extent that relevant data are assembled in connection with 316(a) proceedings, or other studies, they should be used in making determinations pursuant to section 316(b). However, the Agency rejects the related suggestion that a determination under section 316(a) that thermal component of a discharge will not disrupt the balanced indigenous aquatic community in the receiving waters should be conclusive for purposes

of 316(b). In some cases, the data available in 316(a) proceedings will not be sufficient to make a judgment as to 316(b) concerns. Even where the data are complete, however, the conclusion in a 316(a) hearing should not necessarily govern the outcome of 316(b). Certainly, the Agency would not deny a request for less stringent thermal effluent limitations under 316(a) where the necessary statutory showing had been made because of entrainment effects of the plant's intake structure. Similarly, the Agency should not be precluded from addressing evident entrainment problems simply because the plant's thermal effluent is not itself environmentally unacceptable. The concerns of the two sections are different and the legal standards by which compliance with their requirements is to be judged are similarly distinct.

(b) Revision of the proposed regulation prior to promulgation.

As a result of public comment and a continuing review and evaluation of the proposed regulation by EPA, the following changes have been made in the regulations.

The terms "location," "design," "construction," and "capacity" have been defined. Also, the effort to make an explicit distinction between new and existing intake structures has been deleted because the proposed regulation was unclear. Nevertheless, as indicated above, the Agency does consider the age of an intake structure to be a relevant factor and anticipates that it will be taken into account in the determination of best technology available.

(c) Economic impact.

Cost data for construction of various cooling water intake structure modes are included in the

Development Document. An analysis of the projected economic effects of the regulation on the electric power industry, the segment most likely to be significantly impacted by these regulations, has been prepared and is available from the Agency upon request. The inflationary impact of these regulations has, as that analysis indicates, been evaluated in compliance with Executive Order No. 11821 and OMB Circular A-107.

(d) Final rule making.

In consideration of the foregoing, 40 CFR Chapter I, Subchapter N, Part 401 is hereby amended and a new Part 402 is established to read as set forth below, to be effective May 26, 1976.

Dated: April 16, 1976.

RUSSELL E. TRAIN,
Administrator.

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

DECISION OF THE GENERAL COUNSEL

In re Brunswick Steam Electric Plant

June 1, 1976

EPA GCO 41

In the matter of the National Pollutant Discharge Elimination System Permit for Brunswick Steam Electric Plant, Permit No. NC0007064, Southport, North Carolina, the presiding officer has certified four issues of law to the General Counsel for decision pursuant to 40 C.F.R. § 125.36(m). The parties, having had the opportunity to provide written briefs in support of their respective positions, present the following issues:

QUESTION PRESENTED

Timing of Imposition—July, 1981, Guideline Data — Can "best technology available" requirements be imposed under § 316(b), and thus under § 301, prior to the July 1, 1981, date specified in 40 C.F.R. § 423.13(m) for compliance with § 301 thermal effluent limitations?

DECISION

Insofar as § 316(b) addresses a different environmental problem in a different manner than the

§ 301 thermal effluent limitations, § 316(b) determinations are independent of determinations under the thermal effluent limitations. Furthermore, the July 1, 1981, date in 40 C.F.R. § 423.13 was set on the basis of the overall ability of the Steam Electric industry to construct the best available technology—closed cycle cooling systems. Since § 316(b) does not establish a uniform "best technology available", it would be inappropriate to establish a uniform date under § 316(b).

Insofar as neither § 316(b) nor the regulations thereunder specify a time limitation for the application of best technology available, the ultimate compliance date under § 316(b) is governed only by § 301(b)(2)(A) which requires compliance not later than July 1, 1983. Therefore, best technology available under § 316(b) may be imposed in NPDES permits, on a case by case basis, prior to July 1, 1981, so long as the prescribed technology is, in fact, available by the compliance date.

DISCUSSION

Carolina Power and Light Company's (CP&L) argument that best technology available under § 316(b)[1] cannot be imposed until July 1, 1981, (the date, for compliance with thermal effluent limitations) rests on a misapprehension of the relationship between § 316(b) and thermal effluent limitations under § § 301 and 306. CP&L's argument assumes that § 316(b) determinations and thermal effluent limitation

---

[1] Section 316(b) states:

Any standard established pursuant to section 301 or section 306 of this Act and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

decisions under § § 301 and 306 are interdependent and that § 316(b) requirements "ride on the coattails of § 301 effluent limitations." (CP&L's Brief on Issues of Law Referred to the Office of General Counsel, at 13.) Given this assumption, CP&L asserts that § 316(b) determinations are bound by the July 1, 1981, statutory date of compliance with the thermal effluent limitations contained in the Steam Electric Power Generating Point Source Category regulations prescribing "best available technology". (40 CFR Part 423; 39 F.R. 36186, October 8, 1974).

CP&L's underlying assumption that § 316(b) determinations are dependent upon thermal effluent standards is misconceived. First, § 316(b) does not establish effluent limitations for discharges of heat. Rather, it addresses a distinct environmental problem—the withdrawal of massive volumes of water and the aquatic organisms therein through cooling water intake structures. Second, the regulations under § 316(b)[2], unlike the thermal effluent regulations, do not establish a single industry-wide "hest available, technology" standard. That is, the Steam Electric regulations require that *all* plants within specified categories in the industry must attain prescribed thermal effluent limitations by July 1, 1981. Conversely, the § 316(b) regulations do not prescribe a single technology or technologies which all sources in the country must apply.[3] The preamble to § 316(b) regulations states that "the Agency believes that the appropriate technology is best determined after a careful evaluation of the specific aspects at each site."

---

[2] 40 C.F.R. 401.14, 402.10, 402.11, 41 F.R. 17389-90, April 26, 1976.

[3] 41 F.R. 17388.

Third, unlike the thermal effluent regulations, the § 316(b) regulations do not establish a date for compliance with "best technology available." Thus, § 316(b) determinations are bound only by § 301(b)(2)(A) which requires that effluent limitations shall require compliance with best available technology economically achievable not later than July 1, 1983. As CP&L concedes.

EPA has authority to advance the statutory deadline in NPDES permits where regulations do not otherwise establish a compliance date.[4]

Under § 316(b) the best technology available must, of course, be available. In other words, a compliance schedule under the § 316(b) regulations must take into consideration the time necessary to implement the appropriate technology at a given intake structure.[5]

In some cases, the implementation of such technology may require only modest alterations in design, for example, which could easily be completed well in advance of 1981. There is no need to delay the attainment of § 316(b)'s mandate until that date by mechanistic reference to unrelated sections of the law. In other cases, best technology available under § 316(b) may entail substantial changes in cooling water intake structures and associated cooling system alterations. It may not be feasible to make these changes by 1981 in

---

[4] Decision of the General Counsel No. 11, at 3; Decision of the General Counsel No. 23, at 9.

[5] The capacity of a cooling water intake could be restricted under 316(b) so as to necessitate the construction of a closed cycle cooling system. If so, a compliance schedule for such a restriction should be coordinated with any independent requirement for the installation of a closed-cycle cooling system under the Steam Electric guidelines.

certain instances. Thus, the benefits of a flexible case-by-case § 316(b) implementation schedule cut both ways.

QUESTIONS PRESENTED

Type of Control Technology—Can Cooling Towers Be Required—Does § 316(b) of FWPCA allow imposition of closed-cycle cooling requirements since such requirements relate not to the locations, design, construction and capacity of the cooling water intake structures themselves, but rather to the type of cooling system and its thermal discharge technology?

DECISION

Section 316(b) authorizes the reduction of the volume (capacity) of cooling water withdrawn through a cooling water intake structure if such a reduction reflects the best technology available for minimizing adverse environmental impact. Such a reduction of allowable capacity may necessitate the use of a closed cycle or recirculating cooling system. Section 316(b) does not, however, allow for the imposition of closed cycle cooling systems *per se*.

DISCUSSION

Section 316(b) provides that "the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." The major adverse environmental impacts of cooling water intake structures are those affecting aquatic organisms living in the volumes of water withdrawn through the intake

structure.[6] Generally, the organisms are "damaged either through direct contact with the intake structure (impingement) or through "inner plant" effects which occur when the organisms are swept through the intake structure and into the plant itself (entrainment). One means of minimizing entrainment damage in particular is to restrict the capacity of the intake structures and thus the volume of water withdrawn through the intake system. In this manner, the overall exposure of aquatic organisms to entrainment effects may be reduced.[7]

CP&L, however, asserts that the term "capacity" refers only to the velocity of water withdrawn through an intake structure. To the contrary, it seems clear to me that the term "capacity" in § 316(b) means the volume of water withdrawn through a cooling water intake structure. This conclusion is supported by the commonly understood meaning of the term "capacity"[8] the definition of the term in the regulations under § 316(b)[9] and the legislative history of the Federal Water Pollution Control Act Amendments of 1972.

In the course of debating the conference report of the Act on October 4, 1972, the Senate was well aware of the dangers posed to aquatic life by the withdrawal

---

[6] In the Steam Electric industry, the volumes of water drawn through plants utilizing "once through" cooling systems are generally very large. Senate Com. on Pub. Works. A Legislative History of the Water Pollution Control Act Amendments of 1972, 93d Cong., 1st Session, at 196-197 (1973). (Hereinafter cited as Leg. Hist).

[7] 41 F.R. 17388, April 26, 1976.

[8] The Random House Dictionary of the English Language defines capacity (definition 2) as "cubic contents; volume; that which can be contained." (Unabridged 1970).

[9] 40 C.F.R. 402.11(c), 41 F.R. 17390, April 26, 1976.

of large volumes of water through cooling water intake structures.[10] In response to concerns voiced by Senator Buckley that the Act would prevent the effective regulation of this problem, Senator Muskie, the Chairman of the Senate Conference Committee, stated that EPA had authority under the Act to regulate the withdrawal of cooling water so as to minimize adverse environmental aspects.[11]

In this context, it is clear that Congress sought to give EPA authority to regulate the volume of water withdrawn through cooling water intake structures, and that Congress was concerned that EPA should do so where necessary to protect aquatic communities. In short, the term "capacity" must be interpreted to mean the "volume of flow" through a cooling water intake structure so as to be consistent with the dictionary definition of the term, the regulations under § 316(b), and the intent of Congress.

Thus, it does not make sense to define the term "capacity" in terms of the physical size of the inlet opening of the intake structure as urged by CP&L. First, as noted by CP&L, the size of the inlet determines only the velocity of the water withdrawn,

---

[10] During debate, Senator Buckley cited—with approval—two newspaper articles which reported a decision of the Atomic Energy Commission (AEC) to require Consolidated Edison Company to install a closed cycle cooling system at its nuclear power plants at Indian Point on the Hudson River. The articles pointed out that plants withdrew massive amounts of water from the River and, as a result, also withdrew thousands of aquatic organisms each minute. In order to minimize this adverse environmental impact, the articles noted that the AEC had ordered Consolidated Edison Company to stop removing such large volumes of water from the River and to install cooling towers in order to do so. Leg. Hist., *supra* n. 6., at 196-197.

[11] *Id.* at 197-198.

not the volume. Although velocity (and volume) is an important factor in the impingement of larger fish, velocity is not important with respect to the entrainment of smaller organisms. Rather, the volume withdrawn is the principal determinant of entrainment damage which is the major adverse environmental effect associated with most cooling intake structures. (41 F.R. 13788, April 26, 1976).

Second, the Random House Dictionary of the English Language (Unabridged, 1970 Edition) defines "capacity" as "cubic contents; volume; that which can be contained." CP&L's definition of "capacity," then, would prevent EPA from solving a problem which Congress clearly wanted EPA to solve, and it also is contrary to the established definition of the term "capacity."

CP&L also argues that closed cycle cooling technology may only be imposed on the basis of thermal discharge effluent limitations. The definition of cooling water intake structures in the regulations under § 316(b) does not encompass cooling systems.[12] Inasmuch as the scope of § 316(b) only extends to the location, design, construction and capacity of *intake structures*, a closed cycle cooling system *per se* cannot be imposed under § 316(b).

However, CP&L also implies that closed cycle cooling may not be imposed even *indirectly* under § 316(b). That is, CP&L seems to argue that the capacity of a cooling water intake structure may not be restricted under § 316(b) so as to necessitate a closed cycle cooling system. Such an interpretation of § 316(b) is clearly contrary to the Congressional intent

---

[12] 40 C.F.R. 402.11(a), 41 F.R. 13789-17390, dated April 26, 1976.

underlying § 316(b), see discussion *supra*, and would upset the overall framework of § 316.

As discussed in terms of Issue I, § 316(b) and thermal effluent limitation standards require independent determinations. Section 316(b) is concerned with the adverse environmental impact of the *withdrawal* of cooling water rather than the discharge of heated water. The § 316(b) standard is whether the cooling water intake structure reflects the best technology available for minimizing adverse environmental impact rather than whether the discharge exceeds a thermal limitation or whether the discharge interferes with the propagation of a balanced indigenous population of shellfish, fish, and wildlife.[13]

In sum, although § 316(b) does not authorize the Agency to impose a specific closed cycle cooling technology, it does authorize the restriction of the capacity of an intake structure. Such a restriction may necessitate a closed cycle cooling system. This result is not inconsistent with Agency restrictions on the volume of pollutant discharge under § § 301 and 306. That is, while the Agency cannot specify abatement technologies to be employed under those sections, the use of a particular treatment system may be a predictable consequence of the limitation imposed on the discharge of specific pollutants.

---

[13] Thus, the one-standard approach to § 316 urged by Carolina Power and Light was clearly rejected by Congress. In fact, the original House version of § 316 more or less combined § 316(a) and § 316(b) considerations in one standard, but this approach was abandoned in the final conference version of the Act. If Congress had intended to limit § 316(b) determinations to the confines of existing thermal discharge technologies, it could have enacted the House version of § 316 or otherwise linked a determination under § 316(a) to a determination under § 316(b).

QUESTION PRESENTED

Can an NPDES Permit Require Cooling Towers As Such—May the NPDES permit specify use of a particular control technology—in this case closed-cycle cooling towers—or must cooling water intake structure requirements be limited to meeting an established level of environmental performance which is directly related to the degree of significant adverse environmental impact found to be caused by the existing intake structure?

DECISION

An NPDES Permit may specify restrictions on the location, design, construction, and capacity of a cooling water intake structure. A permit may not, as the Region contends, specify a particular closed cycle cooling system technology. On the other hand, a permit need not, as CP&L urges, contain a "performance standard" expressed in terms of the amount of environmental harm to be avoided by compliance with § 316(b). Rather, restrictions under § 316(b) need only reflect the best technology available for minimizing adverse environmental impact.

DISCUSSION

Section 316(b) requires that the "location, design, construction and capacity of cooling water intake structure reflect the best technology available for minimizing adverse environmental impact." Cooling towers or other closed cycle cooling systems are not cooling water intake structures. It is clear that there is no independent basis under § 316(b) to require a cooling tower in a permit. However, under § 316(b) a permit may restrict the volume of flow or capacity of an intake structure. If the capacity of an intake

structure is so restricted, the adverse environmental impact of the intake structure will have been minimized to a given level regardless of whether the company installs a cooling tower. That is, the limitation on intake volume -- not the cooling towers -- protects the endangered aquatic organisms. Cooling towers are an issue only to the extent that a point source may have to install a closed cycle cooling system in order to maintain existing operations if the permit restricts the volume of previously "once-through" cooling water.

Finally, the statute does not require that these cooling water intake structure regulations be expressed in terms of a level of performance which specifies the degree of adverse environmental impact, attributable to the intake structure, which is tolerable. Nor is it clear how compliance with a standard so expressed could effectively be monitored and enforced. The structures must reflect the best technology available for *minimizing* (i.e., "reducing to the smallest possible amount or degree")[14] adverse environmental impact -- significant or otherwise. All environmental harm should be avoided, but the continued operation of a facility will, in most cases, prevent this result. Under § 316(b), EPA s confined to the establishment of technical parameters governing the optimal location, design, construction and capacity of intake structures.

In other words, the goal of best technology available under § 316(b) is to minimize all adverse environmental impacts—not to reduce the impact to a pre-determined level. CP&L's argument to the contrary obscures the critical fact that § 316(b) does

---

[14] Random House Dictionary of the English Language, (Unabridged 1970).

not establish effluent limitations. Rather, § 316(b) *conditions* effluent limitations established pursuant to § § 301 and 306. As such, CP&L's citations to the definition of effluent limitations are misleading. While it is true that an effluent limitation regulates the *performance* which must be achieved and not the technology (CP&L Brief, at 27), § 316(b) specifically regulates enumerated aspects of *cooling water intake structures* rather than the makeup of the intake water.

Accordingly, whereas an NPDES permit may not specify closed cycle cooling systems as best technology available under § 316(b), a permit may specify a particular location, design, construction technique, or capacity for a cooling water intake structure as best technology available.

QUESTION PRESENTED

Is a permittee estopped from contesting the cooling tower requirements of an NPDES permit when said permittee agreed to install such devices by stipulation in settlement of a case before the NRC involving the same facility where the EPA was not a formal party to such proceedings?

DECISION

The permittee is not estopped from contesting the NPDES permit proceeding at issue as the merits of the Stipulation between NRC and the permittee were not actually adjudicated.

DISCUSSION

Collateral estoppel and res judicata apply only to administrative actions which are actually adjudicated.[15] Insofar as the Stipulation between NRC and CP&L was not a result of an adjudication of the merits of the issue but rather represented a pre-adjudicatory settlement, it is not appropriate to apply the principles of collateral estoppel or res judicata against CP&L in this proceeding.[16]

The spectacle of a major power company renouncing the environmental responsibilities embodied in its voluntary agreement with NRC to construct a cooling tower at its Brunswick plant is an unpleasant one. Nevertheless, since an essential prerequisite to the application of res judicata and collateral estoppel is not here present, I do not believe the company should be totally precluded from presenting its case to EPA. See *Grose v. Cohen*, 406 F.2d 823, 824-5 (C.A. 4 1969).

---

[15] Davis, *Administrative Law Treaties*, § 18.03, at 558; § 18.08, at 597 (1958).

[16] See, Decision of the General Counsel No. 33, at 4. It should be noted that the Stipulation provided that:

Nothing in this Stipulation shall affect any authority of the Environmental Protection Agency.

JA-63

1 E.A.D. 332, 1977 WL 22370 (E.P.A.)

United States Environmental Protection Agency
(E.P.A.)
Environmental Appeals Board

IN THE MATTER OF PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE, ET AL.
(SEABROOK STATION, UNITS 1 AND 2)
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM permit

National Pollutant Discharge Elimination System

Application No. NH 0020338
Case No. 76-7

June 10, 1977

DECISION OF THE ADMINISTRATOR

This is a decision on Appeal from the Initial Decision ("I.D.") of the Regional Administrator ("RA") of Region I of the Environmental Protection Agency ("EPA" or the "Agency") dated November 9, 1976. For the reasons set forth below, the I.D. is reversed.

This matter has received extraordinary attention from the press and the public, because of the public debate concerning whether a nuclear plant should be built at a location such as that chosen by the Public Service Company for the Seabrook Station. I think it is important to emphasize that the Agency has played a very narrow role in the process of governmental approval of this nuclear power plant. The Agency's

function in this case is to determine whether the proposed thermal discharge will assure the protection and propagation of a balanced, indigenous population of fish, shellfish and wildlife in and on the receiving waters, and to determine whether the intake structures reflect the best technology available for minimizing adverse environmental impact. This decision should not be interpreted as representing EPA policy on either nuclear power or the overall environmental desirability of the Seabrook plant.

I. Background

A. Procedural Setting

On August 1, 1974, Public Service Company of New Hampshire ("PSCo"), on behalf of itself and the owners of a nuclear electric generating station proposed to be constructed in Seabrook, New Hampshire, filed with Region I an application for an NPDES permit pursuant to Section 402 of the Federal Water Pollution Control Act, as amended ("FWPCA"), 33 U.S.C. §1251 et seq. Because the applicable regulations as then proposed (39 F. R. 8294) and later promulgated (40 C.F.R. Part 423) would require no discharge of heat from the main condensers, with certain limited exceptions, PSCo requested the imposition of a less stringent thermal standard pursuant to Section 316(a) of FWPCA. The filing of the application also brought into play the provisions of Section 316(b) of FWPCA, which require that the location, design, construction and capacity of the cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

PSCo also had pending at the time applications for

construction permits filed in July, 1973 with the United States Atomic Energy Commission ("AEC"), now the United States Nuclear Regulatory Commission ("NRC"), pursuant to the Atomic Energy Act of 1954, as amended. The NRC exercises responsibilities both under that Act and under the National Environmental Policy Act of 1967 ("NEPA"). Action on PSCo's applications proceeded concurrently before the AEC and EPA. In November, 1974, EPA and the AEC published a proposed Second Memorandum of Understanding Regarding Implementation of Certain AEC Responsibilities (39 F.R. 39491, November 7, 1974) ("Proposed Second Memorandum"), which amplified the procedures for coordinating their NEPA and FWPCA responsibilities.

In Paragraph 5 of the Proposed Second Memorandum, EPA agreed to use its best efforts to evaluate impacts on water quality and biota pursuant to Sections 402 and 316 of FWPCA and to complete cooling water intake structure evaluations pursuant to Section 316(b) as far as possible in advance of AEC's issuance of a construction permit. For this purpose EPA undertook to develop regulations establishing a procedure for issuance to the applicant, where appropriate, of "preliminary determinations" specifying the terms and conditions proposed for an NPDES permit pursuant to Sections 316(a) and (b). Paragraph 5 acknowledged that the purpose of the preliminary determinations was to assure, to the extent possible, that considerations regarding impacts on water quality and biota would not result in the need for significant changes in plant design or location subsequent to the completion of AEC's environmental review.

Region I held a public hearing on the application on January 30, 1975 in Seabrook, New Hampshire. Thereafter, no regulations providing for issuance of "preliminary determinations" having been issued by the Agency, on June 24, 1975 Region I issued Determinations concerning Section 316(a) and (b) "procedurally by analogy" to the NPDES and Section 316(a) regulations. These Determinations in effect approved of once-through cooling for Seabrook on certain conditions, but did not specify the location of the intake structure. On October 24, 1975, Region I issued Determinations specifying the location of the intake structure.

The Seacoast Anti-Pollution League and the Audubon Society of New Hampshire (collectively referred to herein as "SAPL") filed requests for adjudicatory hearings with respect to both Determinations as provided in 40 C.F.R. §125.36. The requests were granted by the RA. Thereafter PSCo and the Attorney-General of New Hampshire ("NHAG") requested admission as parties. The hearings were consolidated and held between March 23 and April 2, 1976. The record was certified by the Administrative Law Judge to the RA on May 21, 1976, in accordance with 40 C.F.R. §125.36(1)(1). On November 9, 1976 the RA issued the I.D., in which he revoked the Determinations. PSCo then filed a Petition for Review with the Administrator. On December 7, 1976 the Administrator granted PSCo's Appeal on two issues: the impact of the thermal discharge and the intake design and location. The Administrator stated that PSCo's arguments as to burden of proof were to be presented in the context of these issues.

Briefs were filed on January 6, 1977 by PSCo and by amici curiae Appalachian Power Company, et al. (the "Utilities"). Briefs were filed on February 7, 1977 by the EPA, SAPL, and NHAG and by the following amici curiae: the National Wildlife Federation, the New Hampshire Wildlife Federation and the Natural Resources Council of Maine (collectively referred to herein as "NWF"); the Natural Resources Defense Council and the Conservation Law Foundation of New England (collectively referred to herein as "NRDC"); and Meldrim Thomson, Jr., Governor of the State of New Hampshire. In addition, on February 7, 1977 the Utilities moved to file a reply brief, and on February 22, 1977 PSCo moved to file a reply brief. These motions were opposed by SAPL and are discussed below.

Section 125.36(n)(12) of the regulations provides that the Administrator shall decide the matters under review on the basis of the record presented and any other considerations he deems relevant. Because of the complexities of this case I convened a panel of technical and scientific experts to assist in my review of the record. I have considered the advice of these experts in coming to my decision set forth herein. I also requested and received from PSCo a document mentioned in their brief and not included in the record, entitled "Assessment of Thermal Plume Mortality Attributable to Seabrook Station Cooling Water Discharge Off Hampton Beach, New Hampshire." In addition, as mentioned below, on March 23, 1977 I issued a Request for Information with respect to certain aspects of backflushing, and I have considered all information received in response to that request.

B. Factual Setting

The proposed nuclear electric generating facility, Seabrook Station, will consist of two units, one estimated to begin operation in 1981 and the other in 1983. It will be located in Seabrook, New Hampshire near the Hampton Harbor estuary, about two miles inland from Hampton and Seabrook Beaches (which are on the Gulf of Maine portion of the Atlantic Ocean). As part of the process of generating electricity at the plant, steam which has passed through the turbines must be condensed. Condensing the steam requires the removal of heat and the rejection of this heat to the environment by some type of cooling system. The quantity of heat which must be rejected each hour is 16 x 10^9 BTU, which is the amount of heat that would be obtained from 113,465 gallons of No. 2 fuel oil.

The Seabrook Station condenser cooling water system is called a "once-through" system because there is neither recirculation of cooling water nor any supplementary cooling device, such as a cooling tower or pond. Cold water from the ocean will be drawn into a tunnel through a three-structure intake, at the rate of 824,000 gallons per minute (gpm). The water will flow to the plant, where it will remove heat by conduction through the condenser tubes. At full power, the temperature of this condenser cooling water will increase by approximately 39°F. (The difference between the temperature of the water as it is drawn into the intake and the temperature of the water after it has been heated by passing through the condenser tubes is referred to as the delta-T.) The water will then flow back through another tunnel to a submerged multi-port diffuser where it will be discharged into the

ocean. The quantity of heated water discharged will average 1,187,000,000 (approximately 1.2 billion) gallons per day.

The Seabrook Station would have the highest delta-T of any steam electric generating station now operating in the United States; several stations have higher volume. PSCo states in its Brief (at p. 6) that:

> This high delta T was deliberately chosen in consultation with the marine biologists advising PSCo in order to minimize the volume of water which must be utilized for cooling purposes. This choice was made on the theory that inasmuch as the long travel times and substantial pressure changes necessitated by the use of open ocean, as opposed to estuarine, cooling water coupled with the normal mechanical and chemical effects of any condenser would result in significant (if not total) mortality to entrained organisms, the way to minimize entrainment mortality was to minimize the volume of water utilized. Since the amount of heat to be removed is dictated by the laws of thermodynamics, the only way to reduce the volume of water needed to perform the removal task is to increase the amount of heat removed per unit of water volume, i.e., increase the delta T. Thus, while Seabrook Station will have a delta T that is unusually high, it will take in one-half the water a system having a 20 delta T would, putting at risk one-half the number of entrained organisms.

Seabrook Station would have cooling water intake structures within the meaning of Section 316(b) of FWPCA. The intake will consist of three structures,

each of which is connected to the intake tunnel by a 9-foot diameter riser shaft. Each structure will be circular, with the lower lip being a minimum of 7 feet off the bottom; the top of the structure will be a velocity cap 7 feet above the lower lip; both the lower lip and the velocity cap will have a diameter of 30 feet 6 inches. The three structures will be located 110' apart in a straight line running southeast to northwest. Each structure will take in ocean water at approximately 600 cubic feet per second (cfs), or a total of 1800 cfs, with an entrance velocity of approximately 1 foot per second (fps).

PSCo originally proposed that the intake location should be approximately 3,000 feet east of Hampton Beach in water about 38 feet deep, mean sea level ("MSL"), with the intake openings being approximately 24 feet through 31 feet below the surface, MSL. (This location is herein referred to as the "near site"). In the October 24 Determinations, the Regional Administrator required that the ports be located approximately 4,000 feet northwest of the near site in water approximately 41 feet through 48 feet below the surface, MSL. (This location is herein referred to as the "far site".)

The diffuser through which the cooling water will be discharged will consist of twenty-two nozzles spaced in pairs along a 1000-foot line oriented generally northwest to southeast. The discharge nozzle closest to the shore will be about 5,400 feet east of Hampton Harbor Inlet. The discharge nozzles will be approximately 45 feet below the water surface and seven feet above the ocean floor. The design discharge velocity is 15 fps in a generally eastward direction and

oriented at various angles (either 20° or 25°>>>>>>>>, depending on the nozzle) above the horizontal.

Another aspect of the condenser cooling system of relevance is the so-called "backflushing" operation to clean the intake tunnel. This consists of reversing the flow of the system once or twice a month so that water is drawn in through the diffuser and is discharged through the intake structures. After flow is reversed, the discharge water is brought to a temperature of 120°F by recirculation through the condenser and held at that temperature, through the entire length of what is normally the intake tunnel, for a minimum of two hours. This procedure is intended to control biofouling in the intake tunnel by killing any organisms which may have settled and grown in the tunnel.

II. Preliminary Matters

A. The Appalachian Power Case

The Agency's effluent limitation guidelines and standards for the Steam Electric Power Generating Point Source Category, 40 CFR Part 423, issued pursuant to Sections 301, 304, 306 and 316(a) of FWPCA on October 8, 1974, were challenged by publicly and privately owned electric generating companies in Appalachian Power Co. v. Train, Civ. Nos. 74-2096 et al., 9 E.R.C. 1033 (4th Cir. 1976). It was these regulations that established closed-cycle cooling as "best available technology economically achievable" (?7FBATEA") under Section 301(b)(2)(A) of FWPCA for plants such as Seabrook.

The plaintiffs argued that the Agency's regulations were invalid because the Agency failed to balance the

overall social benefits to be derived from its regulations against their social costs. While rejecting the contention that benefits derived from a particular level of effluent reduction must be quantified in monetary terms, the court held that the Agency must consider the benefits derived from the application of its effluent reduction requirements in relation to the associated costs of alternative levels of heat reduction in order to determine whether the resulting progress is "economically achievable" and whether the reduction in heat discharged represents "reasonable further progress toward the elimination of pollutants." The court also directed that EPA reevaluate its requirements for closed-cycle cooling at generating units located along the coastline.

The effect of the remand of the steam electric generating guidelines was, as urged by the Utilities, to require the Agency to determine what is BATEA for existing sources on a case-by-case basis under Section 402(a)(1). Since the Appalachian Power opinion was handed down on July 16, 1976, after the issuance of the Determinations and the adjudicatory hearing, the RA was faced with the dilemma of how to treat the decision in the pending 316(a) request for the Seabrook Station. [FN1] The RA seemingly had two choices: he could start from scratch to determine what is BATEA for the Seabrook Station, and then go to the 316(a) determination if the BATEA requirements were more stringent than the applicant's requested 316(a) effluent limitations, or he could simply assume that the reconsidered BATEA standards would be more stringent and that PSCo's 316(a) request would

represent a relaxation from that requirement. The RA chose the latter course.

PSCo urges that this is arbitrary, capricious and contrary to law; it does not, however, suggest what position the RA should have adopted instead. PSCo never requested the RA to make a determination of BATEA under Section 402(a). I find that the RA's assumption was an expeditious and reasonable way of ruling on PSCo's pending application without further delay under the unique circumstances of this case.

B. Nature of Section 316(a) and (b)

The RA discussed the nature of 316(a) and (b) and came to some conclusions which are of interest beyond the circumstances of this case. Because this is the first ruling I have made with respect to Section 316, discussion of these aspects of the RA's decision is merited to provide further guidance to all interested persons as to Agency's interpretation of Section 316.

(1) Consideration of Costs under Section 316(b). The RA followed the Agency policy set out in the preamble to the 316(b) regulations (41 F.R. 1738 et seq.), which provides that the Agency must identify or predict adverse environmental effects and then select the most effective means of "minimizing" (defined in the premable as "reducing to the smallest possible degree") the adverse effects. The preamble interprets "best technology available" to mean "best technology commercially available at an economically practicable cost", based on legislative history, and states that Section 316(b) does not require a formal cost/benefit analysis. However, the RA stated that:

> Determining the degree of minimization required calls for a balancing of costs with the magnitude of the environmental impact to be avoided to achieve a reasonable relationship between the costs of the technology and the magnitude of adverse environmental harm avoided.

The RA and the Agency both take the position that, since the regulations require a case-by-case determination of best available technology, consideration of the economic practicability must also be conducted on a case-by-case basis.

The Utilities argue that cost/benefit balancing is required under Section 316(b) and urge affirmance of the RA's decision insofar as it appears to agree with this position. The Utilities cite DuPont v. Train, 541 F. 2d 1018, 8 ERC 1718 (4th Cir. 1976) and Appalachian Power, supra. In Dupont, the Fourth Circuit held that a cost/benefit analysis was required under Section 304(b)(1)(B) with respect to the determination of what is "best practicable control technology currently available" under Section 301(b)(1)(A); Section 304(b)(1)(B) expressly required the Agency to take into account "the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application." In Appalachian Power, as discussed above, the Fourth Circuit held that in determining whether its regulations specified "best available technology economically achievable ... which will result in reasonable further progress towards the national goal of eliminating the discharge of all pollutants" under Section 301(b)(2)(A), the Agency must consider the benefits derived from the application of its effluent reduction requirements in

relation to the associated costs to determine whether in fact the resulting progress is "economically achievable" and whether the progress is "reasonable." The Utilities argue that since "best available technology economically achievable" is equivalent to the term "best technology commercially available at an economically practicable cost," Appalachian Power dictates a cost/benefit balancing under Section 316(b).

I believe that neither DuPont nor Appalachian Power is dispositive of the issue and that the Agency's position, that cost/benefit analysis is not required under Section 316(b), is correct. Section 316(b) provides flatly that cooling water intakes shall "reflect the best technology available for minimizing adverse environmental impact." Unlike Sections 301 and 304, Section 316(b) determines what the benefits to be achieved are and directs the Agency to require use of "best technology available" to achieve them. There is nothing in Section 316(b) indicating that a cost/benefit analysis should be done, whereas with regard to "best practicable control technology currently available" and "best available technology economically achievable" Congress added express qualifiers to the law indicating a requirement for cost/benefit analysis. Indeed, but for one bit of legislative history,[FN2] there would be no indication that Congress intended costs to be considered under Section 316(b) at all. I find, therefore, that insofar as the RA's decision may have implied the requirement of a cost/benefit analysis under Section 316(b), it was incorrect.

However, the RA may have meant only that some consideration ought to be given to costs in determining

the degree of minimization to be required. I agree that this is so—otherwise the effect would be to require cooling towers at every plant that could afford to install them, regardless of whether or not any significant degree of entrainment or entrapment was anticipated. I do not believe that it is reasonable to interpret Section 316(b) as requiring use of technology whose cost is wholly disproportionate to the environmental benefit to be gained.

(2) Interdependence of Section 316(a) and (b). The RA ruled that a determination of the effect of the thermal discharge cannot be made without considering all other effects on the environment, including the effects of the intake (i.e., entrainment and entrapment); the applicant must persuade the RA that the incremental effects of the thermal discharge will not cause the aggregate of all relevant stresses (including entrainment and entrapment by the intake structure) to exceed the 316(a) threshold. I believe this is the correct interpretation of Section 316(a). The effect of the discharge must be determined not by considering its impact on some hypothetical unstressed environment, but by considering its impact on the environment into which the discharge will be made; this environment will necessarily be impacted by the intake. When Congress has so clearly set the requirement that the discharge not interfere with a balanced indigenous population, it would be wrong for the Agency to put blinders on and ignore the effect of the intake in determining whether the discharge would comply with that requirement.

The Utilities argue that the Agency has recognized the independence of 316(a) and (b) in the preamble to the regulations, which states that the "concerns of the two

sections are different and the legal standards by which compliance with their requirements is to be judged are similarly distinct" (41 F.R. 17389). As SAPL points out, the fact that the legal standards of the two sections are different does not mean that factual aspects of the intake may not be considered in making a legal conclusion about the discharge.

The RA also ruled that, as a matter of sound statutory interpretation and good policy, an intake structure would not (as a threshold matter) be "minimizing" adverse environmental impacts if, for example, its entrapment and entrainment effects (examined in the context of all projected stresses on the environment) would interfere adversely with "the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife." I find it unnecessary to rule whether this interpretation is correct because I have determined that the intake structures (examined in the context of all projected stresses on the environment) will not interfere with "the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife."

Finally, the RA ruled that even if entrainment and entrapment effects would not cause an "imbalance" they must be "minimized." This is in accord with Agency policy that "the conclusion in a 316(a) hearing should not necessarily govern the outcome of 316(b)" (41 F.R. at 17389). Thus, the RA concluded, even if the 316(a) burden were met, an applicant could face restrictions on intake capacity which could only be met by use of closed-cycle cooling. I believe this conclusion is also correct. As mentioned above, some consideration of cost relative to the environmental

benefits to be obtained through further minimization would be appropriate.

PSCo argues that the interdependent interpretation of 316(a) and (b) is wrong because it makes it impossible for any applicant to obtain a 316(a) ruling; they point out that the RA ruled the 316(a) showing failed because of the potential effects of the intake structures and at the same time said it was premature to set 316(b) conditions because no 316(a) standard had been established. I do not foresee any difficulty in this regard. The 316(a) and (b) decisions can be made concurrently. Indeed, in cases such as this one, the 316(a) and (b) determinations must necessarily be considered together because the discharge functions as an intake during backflushing and vice versa.

(3) Meaning of Term "Capacity" in Section 316(b). The RA stated that under Section 316(b) restrictions could be imposed on intake capacity which could only be met by application of closed-cycle technology. It is important to note in this connection that the 316(b) regulations define "capacity" as "the maximum withdrawal rate of water through the cooling intake structure" (40 CFR §122.11(e)). The Utilities state that the RA "assumed he could impose closed-cycle cooling under §316(b);" they then argue that 316(b) regulates only the intake structures appurtenant to whatever discharge control technology is independently chosen under other sections. They also argue that "capacity" properly refers to the size of the intake structure, not volume of flow or rate of flow.

It is Agency policy that the Agency may not require use of cooling towers under 316(b); however, it may

restrict the capacity of the intake structures and thus indirectly necessitate a closed-cycle system.[FN3] The RA clearly said no more than this.

The Utilities' explanation for the restrictive reading of the term "capacity" is that the size of a structure, in conjunction with the quantity of water needed per unit time by a given cooling system, determines intake velocity. Although intake velocity is one factor affecting entrapment, it is the volume of water withdrawn that principally determines entrainment. There is no justification for giving "capacity" the restrictive meaning ascribed to it by the Utilities, especially since Congress was aware of and concerned about the entrainment effects of intakes (Legis. Hist. at 196-7). The Agency's definition is supported by the literal definition of "capacity" and by the intent of Congress to minimize adverse environmental effects caused by intake structures.

C. Burden of Proof - 316(a)

The burden of proof rules in the Agency's NPDES regulations (40 CFR § 125.36(i)(1)), which the RA applied "procedurally by analogy" in this case, provide that the burden of going forward and the burden of proof are on the party raising the issue at the hearing. The RA held that these rules were only for purposes of the hearing and that the burden of proof in 316(a) cases rests on the applicant throughout the entire permit proceeding.

PSCo argues that an agency is bound by its own rules and that the RA misinterpreted the burden of proof rules. Based on its burden of proof argument, PSCo

complains throughout its brief that the RA "interposed issues not raised by the parties." It also complains, when the RA "finds" that there is inadequate evidence on various points, that these "findings" are not "supported by the record." The Agency argues that "burden of proof" can mean either burden of persuasion or burden of producing evidence; the burden of persuasion remains always with the same party but the burden of producing evidence can shift between the parties. The Agency argues that SAPL had a burden of showing that PSCo's proposed limitations might not assure protection of the marine ecosystem, and that PSCo had the burden of persuading the RA that a "no discharge of heat" limitation was more stringent than necessary.

I find the RA's and the Agency's interpretation of these regulations to be without merit. Clearly the "burden of persuasion" and the "burden of producing evidence" are the same as the "burden of proof" and the "burden of going forward," both of which the NPDES rules place on the person raising the issue.

However, I do agree with SAPL and NRDC that the burden of proof rules in the NPDES regulations are inconsistent with the requirement of Section 316(a) that the applicant must "demonstrate" his entitlement to a 316(a) waiver. Until the Agency has had an opportunity to listen to all points of view its Determinations should not be final and, until they are final, the applicant, under Section 316(a), has the burden of proof. Accordingly, the regulations at 40 CFR §125.36 were inappropriate for 316(a) hearings in this regard, and I am directing the Office of General

Counsel to consider the need for issuance of regulations designed especially for 316(a) hearings.

Though I disagree with the RA's decision regarding the adequacy of the evidence in this case and find that PSCo has in fact carried its burden of proof, I agree with the principle that an RA has the power and the obligation to reverse his Determinations, regardless of the burden of proof rules, when he concludes that his Determinations were incorrect. This would especially be so where he determines that data adequate to support his Determinations are lacking in the record. The Agency is the representative of the public interest and is not "an umpire blandly calling balls and strikes for adversaries appearing before it; the right of the public must receive active and affirmative protection"[FN4] at the hands of the Agency. The courts have made clear that the Agency must take affirmative steps to obtain the information necessary to sound decisions under the statutes it administers, even at the cost of delay; if there is insufficient evidence in the record to sustain the Determinations, there is no choice but to reverse the Determinations until adequate data are adduced. Therefore I commend the RA for the courage and responsibility shown by him in his I.D.

I wish to emphasize that this case points out the importance of close scrutiny by the Regions of an applicant's plans for a 316(a) demonstration and its implementation of those plans; it also highlights the need for a thorough analysis of the applicant's submission before issuance of Determinations. I note in this regard that PSCo's demonstration appears to

consist of a series of reports and affidavits without the "interpretive, comprehensive narrative summary of the demonstration ... [including] a clear discussion stating why the applicant's demonstration is sufficient to assure that the proposed discharge will assure the protection and propagation of a balanced, indigenous community"[FN5] suggested by the Draft 316(a) Manual. Review both at the Regional level and on Appeal would be assisted by such a document. Without passing on the merits of that case, I note that the RA's Determination of March 4, 1977 regarding a proposed unit at the Pilgrim Power Plant appears to provide the type of discussion I have in mind.

D. Burden of Proof - 316(b)

The Utilities argue that the Agency has a duty to implement Section 316(b) and that the RA's decision improperly shifted the burden of proof to the applicant by adopting rules of thumb. For instance, the RA said that an intake structure should be located in waters which are the least productive biologically and should avoid areas such as spawning areas, nursery areas, etc. The Utilities argue that this, coupled with the RA's unduly stringent standard of proof (discussed below), amounts to a per se rule requiring closed-cycle cooling at all estuarine plant locations. They point out that the Agency expressly declined to adopt such a per se rule in the preamble to the 316(b) regulations (41 F.R. 17388).

The RA essentially did no more than repeat the language of the Development Document accompanying the 316(b) regulations, which concluded with respect to consideration of location in 316(b) cases that:

> Plant siting and the location of the intake structure with respect to the environment can be the most important consideration relevant to applying the best technology available for cooling water intake structures. Care in the location of the intake can significantly minimize adverse environmental impacts ... [A]mong the many factors that can be considered in locating the intake structure to minimize adverse environmental impacts [are] ...:
>
> > -Avoidance of important spawning areas, fish migration paths, shellfish beds or any location where field investigations have revealed a particular concentration of aquatic life.
>
> It will be difficult [sic] and perhaps impossible in certain cases to offset the adverse environmental impact of improper intake location by subsequent changes in either design or operation of the intake structure short of significantly reducing the intake volume and/or the development of an effective fish recovery or diversion system. (at 178)

Substantially similar language was contained in the predecessor Development Document dated December 1973, at 144-5. It is clear that the RA did not establish a per se locational rule, but merely considered the intake in the light of the factors described above.

E. Standard of Proof

The RA said the applicant must provide the RA with "the evidentiary showing needed to make a reasoned decision" as to whether the 316(a) test was met and that "adequate information" must be furnished as to the projected stresses on the aquatic environment from all sources. This is clearly correct. However, in the

I.D. the RA occasionally used some phrases which implied a much higher standard of proof. For instance, he said that information on the "the whole marine ecosystem" may be necessary.
PSCo argues that the RA imposes an impossible standard of proof under 316 because he demands a showing with respect to the "whole marine ecosystem" and he seeks absolute assurance and scientific certainty in an area which is complex and uncertain. PSCo argues that the proper rule is "preponderance of the evidence". The Utilities join in this argument. Also, they argue, the RA refused to make an intelligent choice on the basis of reasonably available evidence; the effect is to require cooling towers in every case because the RA is requiring evidence to a degree of precision which is in fact unattainable.

As the Agency points outs, the burden of proof in a 316(a) case is a stringent one. The "preponderance of the evidence" rule would be inappropriate if the evidence being weighed were inadequate. The RA may not speculate as to matters for which evidence is lacking. On the other hand a biologist experienced with thermal discharges, who reviews evidence as to certain species, can often conclude with assurance (based upon his knowledge and experience) that adverse effects will not be suffered by other species or life stages not mentioned.

The question is, at what point is the evidence adequate for a 316(a) determination? No hard and fast rule can be made as to the amount of data that must be furnished. Much depends on the circumstances of the particular discharge and receiving waters. It would be an unusual case where data would be required as to the

effects on the "whole ecosystem".[FN6] Effects on one group of organisms can generally be inferred from the effects on another group of organisms. This is the theory behind the representative important species ("RIS") approach to 316(a) demonstrations (40 CFR §122.9(b)(2)). Data should not be required to be furnished simply because they are collectible, if the data would not aid in the determination to be made. For instance, in this case the RA found that data as to the thermal tolerances of certain life stages of RIS were missing. Though this is true, I find that, examining the data in the record in the light of an informed scientific judgment, it is not necessary for PSCo to furnish further data; the available data are sufficient for me to conclude that there will not be an imbalancing of indigenous populations. However, in another case, the applicant might have to furnish not only complete data as to the RIS, but possibly additional data.[FN7] The greater the risk, the greater the degree of certainty that should be required. The rule is stated reasonably well in the Draft 316(a) Manual:

> Mathematical certainty regarding a dynamic biological situation is impossible to achieve, particularly where desirable information is not obtainable. Accordingly, the Regional Administrator (or Director) must make decisions on the basis of the best information reasonably attainable. At the same time, if he finds that the deficiencies in information are so critical as to preclude reasonable assurance, then alternative effluent limitations should be denied. (p. 8)

In this connection I note that the RA apparently felt

constrained to avoid discussion of the merits of the case with his technical staff after the hearing because they were "parties" to the case and could not be consulted in the absence of the other parties. Consequently the RA was deprived of the opportunity to consult with experts experienced in the matter of thermal discharges, and reviewed the record with only the assistance of his legal staff and a biologist hired for the purpose. This unfortunate result appears to have occurred partly because the Agency took a position in favor of its Determinations (i.e., in support of PSCo) at the hearings, thus becoming "party" as well as judge. This seems to to me to have been unnecessary and of dubious propriety.

I am requesting my staff to review this aspect of the case with a view toward assuring that in future 316 cases RAs will have available to them adequate Agency resources to assist in the review of the record. In connection with the review of the regulations mentioned above, I am asking the Office of General Counsel to review the question of whether the Agency should act as a "party" in 316(a) proceedings.

F. Receiving Waters

One of the underlying questions to be considered in making the decision in this case was what should be considered as the receiving waters. The Hampton-Seabrook area is part of the Gulf of Maine, a much larger body of water, which in turn is part of the Atlantic Ocean. Obviously an impact which created an imbalance in the local indigenous populations might not be felt in the Gulf of Maine or the Atlantic Ocean. Put another way, if the Atlantic Ocean (or a portion of it as large as the Gulf of Maine) is to be considered as the

receiving water, then Section 316 might be a dead letter as to coastal power plants because plants of a size likely to be built probably would not have an effect on such an enormous body of water. Therefore I think that in order to give effect to Section 316 it is necessary to look at a smaller portion of the coastal waters where human use or enjoyment of the marine resource may be affected. The portion chosen is necessarily arbitrary to some extent where, as in this case, there are no obvious physical boundaries.

For this case I have determined that the appropriate area to look at in considering the effects of Seabrook's discharge is the localized area within and proximal to Hampton Harbor, which includes the estuary area with its biologically rich fauna. However, while doing this I have taken into account the fact that this localized area is part of, and is fed by, the larger area of the Gulf of Maine and the Atlantic Ocean. For instance, local populations of certain species of fish are supplemented by recruitment from the Gulf of Maine. Thus the impact of the Seabrook discharge on this localized area is less than it would be if the localized area were a closed body of water of the same size.

III. The Thermal Discharge (316(a))

A. Effect under Normal Conditions

The RA found, on his review of the record, that there was inadequate evidence as to the direct and indirect effects of the thermal discharge on indigenous populations, in various particulars.

In reviewing the adequacy of the record I have utilized the expert judgment of the technical and scientific

panel mentioned above. The biological experts on the panel reviewed the record with the benefit of their general knowledge and judgment. The technical and scientific panel panel also have experience with thermal discharges and were able to bring their experience to bear in determining the probable effect of the Seabrook operation on RIS and indigenous populations.

Unlike many other plants, Seabrook will use a multiport, high-velocity diffuser which is designed to minimize the exposure of marine organisms to high temperature regions. This design means that there will be only a small area or volume of water in which significant lethal or sublethal effects would be expected on any organisms. (This is quantified in PSCo's brief, which states that under full load conditions, the 10°F isotherm will encompass a maximum volume of 0.33 acre/feet and the 5°F isotherm will encompass a maximum volume of 3.03 acre/feet).[FN8] Thus the Seabrook discharge will affect only a small portion of the Gulf of Maine within or proximal to Hampton Harbor.

Moreover, I believe, on the recommendation of the panel, that the intake should be located at the far site, which will further minimize any potential environmental effects. The data are inadequate for a 316(a) demonstration at the near site because worst case conditions were not assumed in modeling the thermal impact of backflushing from the near site on the Sunk Rocks. In any event, the far site is much preferable to the near site because: 1) there will be less likelihood of thermal impact on the Sunk Rocks

resulting from backflushing at the far site; 2) the near site is located close to the presumed migratory pathways in and out of the estuary; 3) entrainment of meroplankton of coastal species will be less at the far site (this is expected to compensate for the possibility of an increased entrainment of pelagic plankton); and 4) the outcroppings at the Sunk Rocks area will attract fish to this site and will increase entrapment there.

The panel concluded that the net effect is that significant environmental impacts cannot be anticipated in the area affected by the discharge, and that the data available in the record indicate that the "balanced indigenous population" of shellfish, fish and wildlife in the Gulf of Maine within or proximal to Hampton Harbor will not be significantly affected. They therefore concluded that it was not necessary to have thermal effects data on all life stages of all RIS, as the RA had required.[FN9] I agree with these conclusions.

Regarding data as to the size and stability of populations, the panel concluded that determinations of the species distribution, abundance and relationships among components of the ecosystem might exceed the state-of-the-art, especially for certain types of organisms. The relationships between and among the species comprising a given assemblage (i.e., "population" as used in Section 316(a)), such as the benthic community or the phytoplankton community, are extremely difficult to define and elaborate. This difficulty increases as a function of the number of components to be considered. As mentioned before, it is much easier to understand or model a community of

five species which may interact with each other than one of 20 species. The potential for interaction increases as a factorial of the number of species. Also, generally the species for which studies are available are those of economic or ecological importance, either because of numerical dominance or wide distribution. Consequently, many species have not been studied to a level that permits defining their role in the ecosystem. Accordingly I do not find it necessary to have the degree of information as to size and stability required by the RA in order to make a judgment as to the impact of Seabrook.

The RA also found that there was no useful information in the record concerning the volume of water which would be entrained in the thermal plume and thus no way of estimating the numbers of planktonic organisms, for example, that would be exposed to the heated water. Actually, using data in the record, the numbers of plankton entrained can be approximated. However, even without estimates of numbers of plankton entrained it can be concluded that the overall impact of such entrainment on the population of all plankton in the Gulf of Maine within and proximal to Hampton Harbor will not be significant. This is because the portion of the plume which contains water of sufficient temperature to shock or kill plankton is small relative to the available water mass; many plankton will be quickly replaced because of their rapid regeneration times; and recruitment from other areas will replenish stocks.

The RA was concerned that much of the data on thermal tolerances in the record was based on studies in which organisms had been acclimated to

temperatures other than those that will occur at Seabrook and that they were of questionable relevance to an effort to estimate the impact of exposure to a quick temperature increase such as will be experienced by organisms entering the Seabrook discharge. He was also concerned that some studies noted lethal temperature limits below those of the Seabrook discharge even though these studies generally involved gradual temperature increases. The RA felt that, together, the lack of thermal data and the lack of information about numbers of organisms exposed made it impossible to determine the overall direct impact of the plant. On the recommendation of the panel, however, I find that, given the small area to be impacted with a delta-T greater than 5°F, it is reasonable to conclude that local indigenous populations will not be significantly affected.

B. Effect Under Backflushing Conditions

The RA found that the record did not contain an adequate discussion of the thermal effects of the intake operating as a discharge during backflushing or of the entrapment potential of the diffuser acting as an intake. Upon review of the record I found it inadequate as to the effect of backflushing. Specifically, I found that there was no information in the record on the vertical structure of the backflushing plume, and therefore the three-dimensional plume structure could not be developed from the information in the record. Hence, estimates of exposures of plankton and other organisms to the various temperature regions of the backflushing plume could not be established. I therefore issued a Request for Information, requesting PSCo to supplement the record with respect to these matters and offering the

parties an opportunity to submit comments and requests for a hearing. Affidavits were submitted by PSCo, NHAG, EPA and SAPL. SAPL submitted a request for a hearing, which is dealt with below.

During backflushing, heated effluent discharged from the intake at the far site could, under occasional meteorological and hydrological conditions, cause a 3°-4°F rise for about 3-6 hours twice a month around the Outer Sunk Rocks (less often during the winter). Such a small increase for such short time periods should result in no biologically significant lethal or sublethal effects on the communities in the area of the Sunk Rocks. The discharge will not affect benthos in the vicinity of the backflush because of the buoyant nature of the plume. Nekton should for the most part be able to avoid lethal temperature elevations in the discharge plume, though some fish may be killed upon start-up of the backflushing operations. There is no reason to believe, however, that such fish kills, if they occur, will be in numbers sufficiently large to cause an imbalance in the indigenous population, even taking into account the other stresses upon the affected species.

Plankton could suffer lethal or sublethal effects as a result of entrainment in the higher temperature regions of the backflushing plume. However, the volumes of water which will be heated sufficiently to cause these effects are small. Moreover, the number of plankton killed by passage through the plant will be considerably lower during backflushing than during normal operations, due to the decreased flow. A review of the record convinces me that the impact of backflushing on plankton will be insignificant.

Regarding Mya larvae, in response to the Request for Information, PSCo submitted a calculation indicating that 70 bushels of Mya would be destroyed indirectly due to the effects of entrainment of larvae in the backflushing plume during the month of maximum impact. PSCo made the assumption that this loss would be distributed evenly over the 2500 acres of clam flats between southern Maine and northern Massachusetts and calculated that only 0.12% of the Mya harvest in the Hampton-Seabrook area during 1975-6 would be destroyed. Also, in Draft Technical Report VII-3, PSCo's consultant made similar calculations with respect to normal operations and concluded that normal operations would result in destruction of only 0.4% of the Hampton-Seabrook 1975-6 harvest. These calculations are open to doubt because the survival ratios used would not allow the maintenance of a Mya population at equilibrium in the Hampton-Seabrook estuary.

Destruction of Mya larvae could result from entrainment through the plant during normal and backflushing operations and entrainment in the thermal plume during normal and backflushing operations. Draft Technical Report VII-3 made a reasonable estimate of Mya mortality due to through-plant entrainment as 83×10^9 larvae. As indicated above, larval mortality due to plume entrainment during normal operations would be insignificant. It is reasonable to assume that backflushing will occur three times each summer when there are larval Mya densities of any significance, and that larval Mya densities at those times will be $2500/m^3$. Assuming that the average backflushing flow is one-half that of

the normal flow rate, it can be calculated that about 5 x 10^9 Mya larvae would suffer mortality due to through-plant entrainment during the three backflushing operations.

Regarding entrainment in the backflush plume, in the absence of experimental data to the contrary it is reasonable and probably conservative to assume, as Bosworth did in his supplemental Affidavit, that Mya larvae entrained in the backflush plume will be killed if subjected to a temperature greater than 79°>>>>>>> F. From the equations provided in the supplemental Affidavit of MacPherson it can be calculated that at a delta-T of 56°F approximately 12 x 10^9 Mya larvae will be killed by entrainment in the backflush plume during the three backflushing operations.

Thus the mortality of Mya larvae from all sources related to the Seabrook operations would be approximately 1 x 10^{11}. The total seasonal production of Mya larvae in the neritic band in the vicinity of the Seabrook cooling system is reasonably estimated in Draft Technical Report VII-3 as 2 x 10^{12} larvae. Thus the larvae killed would be about 5% of the larvae in the neritic band in the vicinity of Seabrook. If it is assumed that destruction of Mya larvae would result in destruction of the same proportion of adult clams, the Seabrook operations would be expected to destroy approximately 5% of the standing crop of Mya in the Hampton-Seabrook area. (This figure is of the order of magnitutde of the figure arrived at by use of an entrainment model discussed elsewhere in this decision.) This 5% figure represents a considerable over-estimate because larvae settle in densities much

greater than the final density of adult populations. Considering that a single adult clam, which may have a life span of 3-4 years, releases several million eggs per spawning and my spawn several times each year, a loss of this order is not expected to have a significant impact on local populations.

I note that there appears to be serious over-cropping of Mya larvae in the Hampton-Seabrook area, which could doubtless be controlled through appropriate licensing laws. The effects of the Seabrook plant will not have any significant impact on the number of clams recruited to the Hampton-Seabrook flats or other estuaries. The over-cropping of clams in Hampton-Seabrook could have an effect on recruitment of clams to other areas, but probably does not have much impact on recruitment to Hampton-Seabrook itself. The evidence indicates that tidal flushing is rapid, with complete flushing in one one or two tidal cycles, so that reproductive products from the Hampton-Seabrook flats will be washed out of the estuary. However, it must be stressed that if there is any threat to successful recruitment of clams to other areas, the threat would be posed by the overcropping and not by the plant.

In connection with backflushing, I note that the effect of backflushing, particularly the effect on the Sunk Rocks area, can to some extent be mitigated by avoiding backflushing during adverse meteorological and hydrological conditions. While the Determinations do not expressly require backflushing to be avoided at times of adverse meteorological conditions, I note that Condition I(C)(6) provides that NPDES permits issued from time to time in regard to the discharge will

contain such further limitations or be modified to contain such further limitations on the thermal component of the discharge as the results of available information indicate to be necessary to assure the protection and propagation of a balanced indigenous population. I hereby direct the RA to give due consideration to the development of further conditions pursuant to this clause. Specifically, I understand and interpret Condition I(C)(6) as meaning that the NPDES permit as issued for the plant will contain appropriate limitations in regard to the avoidance of backflushing at times of adverse meteorological and hydrological conditions.

C. Cold Shock

The RA "granted" a finding requested by SAPL that unexpected shutdowns of the diffuser would cause measurable impacts on the balanced indigenous population ("cold shock"), "in view of [his] findings concerning lack of information on the thermal effects of the diffuser on plankton, and for similar reasons...." It is not clear whether the RA meant to find that cold shock would in fact occur or whether he meant simply that he had inadequate evidence to decide the question, but in either event I disagree. Cold shock requires that an organism maintain itself in the warm environment long enough to become acclimated and then be quickly exposed to cold water. As PSCo points out, plankton could not resist the current that flows away from the diffuser; once in the plume, they would experience only gradual temperature decreases. The high velocity of the discharge should prevent fish from inhabiting, and therefore becoming acclimated to, the plume areas of highest temperature, a prerequisite for cold shock. Because of this velocity, fish are unlikely to become

acclimated to a temperature greater than 5° above that to which they would be exposed during shutdown. Generally, a decrease of 15° to 25°>>>>>>> F is necessary for fish to be killed by cold shock. Benthic organisms would not be exposed to a rapid temperature decrease because the thermal plume rarely impinges on the bottom and will result in temperature increases on the benthic community of, at most, 1°F or 2°>>>>> F for short periods of time. Therefore these organisms would not become physiologically acclimated to the plume. The statements made by witness Leger in Exhibit 37 reflect what is generally accepted by fish biologists involved in thermal effects research. He concluded that cold shock would be minimized at Seabrook.

Past instances of cold shock at thermal power plants have occurred predominantly within surface discharge canals. For example, Leger mentioned menhaden kills in the discharge canal of the Oyster Creek plant in New Jersey. Even surface discharges do not always experience cold shock problems. Leger was able to find no record of cold shock at any New England power plant, including those with surface discharges at Brayton Point, Cape Cod Canal, and Pilgrim Nuclear. Submerged discharges such as that proposed for Seabrook are much less likely to cause cold shock fish kills. I conclude on the basis of design and past history in New England that cold shock will be an infrequent and insignificant problem at Seabrook, and that unexpected shutdown of the diffuser will not cause measurable impacts on the balanced indigenous populations.

D. Impact on Wildlife

The RA concluded that there was no evidence on the question of whether there will be any impact on wildlife, such as birds. This is not completely accurate because there are data on the effect of the plant on the biota on which birds feed. I have concluded elsewhere in this decision that the effect of plant operations on these biota will not be significant. On the basis of this record, I find there is no anticipated effect on wildlife, including birds, from this subsurface thermal discharge. That being the case, I do not believe that PSCo should be required to adduce further evidence in this regard.

E. "No Measurable Rise"

The RA decided that he had correctly limited the thermal discharge from backflushing and normal discharge to "no measurable rise" at the Inner and Outer Sunk Rocks, since (a) backflushing water might be mixed with water at the "highest naturally occurring temperature" and create "water above the natural high;" (b) operational adjustments can be made to manage the thermal impact; and (c) the information on thermal impacts was inadequate. PSCo urged adoption of a limitation of "no measurable rise above naturally occurring temperature fluctuations of the receiving water in and around the area of the Inner and Outer Sunk Rocks."

On review of the evidence in the record as to the effect of temperatures on the Sunk Rocks biota, I find that the RA's criterion of "no measurable rise" was too stringent. Taken literally, this standard means that a rise of as small as 1/10 of a degree (which would be a "measurable rise") could not be tolerated at the Sunk

Rocks. Model studies predict slight temperature rises at the Sunk Rocks during backflushing. Such rises would not have an impact on indigenous populations sufficient to cause an imbalance.

On the other hand, the standard suggested by PSCo (that the temperature should not exceed naturally occurring ambient temperature fluctuations of the receiving waters in and around the area of the Inner and Outer Sunk Rocks) is ambiguous. It is not clear where the "ambient" temperature fluctuations would be measured (vertically or horizontally) and during what time periods they would be measured.

Both standards seem to be unsuitable for enforcement purposes, since it is not apparent how compliance with either standard could be measured. For instance, if thermistors were placed at the Sunk Rocks there would be no way of telling whether any rise in temperature registered by them was due to natural causes or to the impact of backflushing. The RA should delete the "no measurable rise" criterion and should replace it, if desirable, with some other enforceable criterion appropriate for the protection of the Sunk Rocks biota.

F. Baseline Data

The RA found that there was inadequate baseline data and that this would hamper later efforts to study the changes wrought by the plant for the purpose of taking corrective action. I agree. I hereby direct the RA to review the report of the technical and scientific panel in this regard with PSCo and to require PSCo to develop a plan to provide adequate baseline data which will be acceptable to the RA.

G. Conclusion

On the basis of the data in the record, as supplemented pursuant to the Request for Information, and on the recommendation of the panel whose advice I have sought, I conclude that the discharge limitations proposed for the far site will assure the protection and propagation of a balanced, indigenous population of fish, shellfish and wildlife in and on the receiving waters. In coming to this conclusion I have considered the effects of the entire cooling system, including entrapment, entrainment, and discharge.

IV. The Intake (316(b))

A. Design

After reviewing the evidence in the record on velocity, the RA found insufficient evidence to conclude that the 1 fps velocity proposed for the intake was the best to minimize entrapment, and suggested that diversion or other means of avoiding fish entrapment may be necessary. Velocity is only one of several factors influencing entrapment by intakes. While fish entrapment is reduced as velocity at the intake face is decreased, the design of the structure is also critical. Modifying the conventional velocity cap by extending the upper and lower lips (to obtain a "T" structure) reduces entrapment. Also placement in the water column influences entrapment. Finally, the most important factor is the location of the intake in relation to the location of potentially entrapable organisms. I find that all of these criteria, including intake velocity, have been taken into account in designing the intake structures.

In an ultimate sense it is impossible to optimize velocity, since the optimum velocity for one species at one life stage may not be the optimum velocity for that species at another life stage, or for some other species. At different times of the year different species can be expected to be susceptible to entrapment by the intake. Consequently, designing for a single velocity cannot protect all fish at all times. Moreover, as the RA points out in his I.D., the entire range of values between 0.5 fps and 1.0 fps will be found within a very short distance from the intake. To attempt to further refine the velocity in this case is unnecessary and not likely to result in any measurable reduction of entrapment loss (which will be negligible in any event).

Moreover, because entrapment will be negligible (as discussed elsewhere herein) I do not believe that the intake structures need be further refined to provide diversion or other means of avoiding entrapment. I note, however, that should this prove to be incorrect, the Determinations require, in Condition II(H), that NPDES permits issued from time to time in regard to the cooling water intake structures must contain such further limitations and requirements as available information indicates to be necessary to minimize adverse environmental impact.

B. (1) Location - Entrapment

The RA found that even if the effects of the intake alone (entrainment and entrapment) were considered, the impact on many species was unknown and could be significant. Specifically, the RA found that there was inadequate information on actual migratory pathways in and out of Hampton Harbor, and little evidence of the actual overall abundance of the finfish species in

the area potentially impacted, at either the near site or the far site.

It is true that only limited data exist on the migratory pathways of fish to and from Hampton Harbor. However, fish migration is commonly diffuse and not associated with a precise narrow path unless there is some continuous physiographic characteristic for orientation, such as the contour of a significant change in depth. Both the Sunk Rocks and the intake areas are point locations rather than continuous physiographic characteristics, and migrating fish would not be expected to consistently move through these areas. Rather, they would more likely occur there only through random migratory movements. Consequently neither substantial entrapment nor disruption of migratory movements can be expected. It is highly unlikely that studies of fish migration, which would be very expensive and time-consuming, would yield any useful information with respect to the best location for the intake structures. I cannot therefore conclude that they are required in this case.

Moreover, I believe that the evidence in the record indicates that entrapment is likely to be negligible. That being the case, I cannot conclude that studies of the actual abundance of finfish in the area are necessary.

B. (2) Location - Entrainment of Mya

PSCo studied the extent to which Mya larvae would be entrained by the intake by means of a model. Under PSCo's model the flow of water into the intake is determined and compared with the flow of water in a hypothethical area in the near-shore waters. The flow

into the intake is assumed to be a box with a fixed length of 1000' and widths and depths which vary with ambient current speed and density stratification. This "entrainment box" represents the bounding streamlines leading to the intake; all of the larvae in this box are "entrained" per unit time. The number of larvae in the entrainment box is calculated and compared with the number of larvae in a hypothetical volume (used as the assumed habitat of the Mya larvae) which is 2 1/2 miles wide and 30 feet deep; the length of this volume is determined by the ambient velocity being considered.

The RA found that the assumption in the model of uniform distribution of Mya larvae is unreliable in view of the known patchiness of larvae. He also found that current speed determines the width of the streamlines of the intake flow in the model and could even lead to repeated exposures to plant-induced stresses; thus, due to greatly varying current levels and patchiness of larvae, actual larval mortality might greatly exceed the predicted 4.6%. The RA found on the one hand that this impact could be potentially severe and on the other hand that it was impossible to estimate what the impact of a 4.6% mortality would be on adult populations.

Mya larvae are acknowledged to be patchily distributed; however, if the larvae are looked at over a large enough time and space scale, the effect would tend to be the same as uniform distribution. Over the time and space scales used in PSCo's model (which were reasonable for Mya), it is valid to assume that patchiness would tend to become integrated. That being the case, there would be no point in trying to

model patchiness because such an effort would not yield significantly different results from the calculations already furnished by PSCo.
The model is based on assumptions which are highly conservative, for various reasons, and thus yields results which are likely to exceed actual mortalities. Mya in fact occupy a volume which is longer than the hypothetical Mya habitat used in the model; in other words, they occur to the north and the south of the 2 1/2 mile-wide box. Thus, if for instance the model says that 4.6% of larvae are entrained, in fact this is 4.6% of only a portion of available Mya larvae.

When the model is run with very slow currents, the percent of larvae entrained rises until 100% entrainment is approached. However, it is unrealistic to assume that, in the hydrodynamic situation present at the intake site, there will be a long period of slow currents. Consequently the fear expressed by SAPL, namely that under slow current conditions a large percentage of Mya would be entrained, is unrealistic; it ignores the tide, wind and density current conditions in the Gulf of Maine. The problem is analogous to that of patchiness. Considering only tidal currents, if a short time period is examined, a slow current and high percentage of larvae entrained are possibilities, but over a longer time period slow currents will alternate with fast currents; these flows will tend to average out to a typical flow. The conditions assumed by PSCo regarding typical flows are reasonable.

Also, the model breaks down at low current speeds because it indicates that water would be entrained from all directions in the Gulf of Maine—in other words, that the intake would function as a drain in the

bottom of a basin. This would not in fact happen, and thus the high larval entrainment which the model predicts under such circumstances will not occur.

While the model is a simple one of limited utility, it is sufficient, because of the conservative nature of its predictions. For instance, PSCo found that under different density stratifications and plankton distributions 2.9% to 4.6f Mya would be entrained. The 4.6% figure is in itself conservative because it represents conditions in which Mya are oriented toward the bottom of the entrainment box under extreme summer stratification conditions. It is unrealistic to suppose that such conditions would continue for long periods of time, or that Mya would be so oriented during the entire period of their journey past the intake. Also the calculations were made for the inshore site which has intake openings approximately 24-31 feet below the surface (30 feet in the model); at the offshore site the intake openings are 41-48 feet below the surface. It is difficult to envisage entrainment over this entire depth. Thus for various reasons the estimated 4.6% mortality can be expected to be on the high side.

A more sophisticated model could be developed which would take into account tides, wind and the thermohaline circulation, but it is doubtful if the estimate or its predictive value would be significantly improved. A 4.6% reduction in larvae cannot be expected to result in a 4.6% reduction of the adult population because it does not take into account compensatory mechanisms and density-dependent limiting factors. Taking into account both the highly conservative nature of PSCo's model and the post-

larval mortality of Mya, I conclude that entrainment of Mya will have an insignificant effect on adult Mya populations.

B. (3) Location - Entrainment of Icthyoplankton

The RA found that it is impossible to conclude whether the near or far site would represent an advantage with respect to entrainment of ichthyoplankton, and that the overall effect of such entrainment on adult populations is unknown.

The far site would offer an advantage with respect to icthyoplankton since it lies in deeper water. The majority of eggs of many species are found near the surface of the ocean and hence would escape entrainment. Moreover, the far intake site is believed not to be located in the immediate vicinity of unique spawning beds for any species. That being the case, post-larval recruitment of fishes from other areas would reasonably be expected to offset any effects of entrainment.

C. Diffuser Functioning as Intake During Backflushing

The RA found the record inadequate with regard to discussion of the effects of the entrapment potential of the diffuser acting as an intake. Upon review of the record I have concluded that it is not inadequate and that the use of the diffuser as an intake during backflushing is not likely to cause entrapment in any degree more significant than the intake. This is because of four factors:

1. Entrapment problems can result because fish seek shelter near a structure. However, the diffuser risers

are small and provide less shelter than the intake structure.

2. During a considerable portion of the backflushing cycle (2 1/2 hours out of a six-hour cycle), the volume of flow is only 38% of the normal flow.

3. The backflush cycle occurs only about 1.8% of the time during the summer and less in winter.

4. The diffuser pipes are not too far from horizontal (20°-25°>>>>>>>>>) and thus, even without velocity caps, the intake will be nearly horizontal.

I note that PSCo is required by Condition II(C) to use an antifouling protective coating on the cooling water intake structure, to discourage growth of organisms which might attract browsing fish which would then be susceptible to entrapment. I direct the RA to consider whether a similar condition should be required with respect to the diffusers to reduce possible entrapment losses.

D. Conclusion

I find that the design and location of the intake at the far site and of the diffuser functioning as an intake reflect the best available technology for minimizing adverse environmental impact. In coming to this conclusion I have taken into consideration the effects of the discharge as well.

IV. Other Issues

A. Applicability of Section 403

NWF argues that the RA's determination to

disapprove the Seabrook discharge is independently sustainable under Section 403 of FWPCA. Section 403 prohibits issuance of a permit under Section 402, after promulgation of guidelines estabished under Section 403(c), except in compliance with such guidelines. Prior to the promulgation of such guidelines, a permit may be issued under Section 402 if the Administrator determines it to be in the public interest. Section 403(c) requires promulgation of guidelines for determining the degradation of the waters of the territorial seas, the contiguous zone, and the ocean, which shall include, among other things, the effect of disposal of pollutants on plankton, fish, shellfish and wildlife; the effect of disposal of pollutants on marine life, including changes in marine ecosystem diversity, productivity, and stability and species and community population changes; other possible locations and methods of disposal or recycling of pollutants; and the effect on alternate uses of the oceans, such as scientific study. There are no currently applicable 403 guidelines, the ones promulgated in 1973 having been revoked (38 F.R. 28613).

PSCo and the Utilities argue that Section 403 does not apply to discharges of heat. This argument runs counter to the express language of FWPCA. Section 403 applies to permits for "discharges"; this is a term of art in the statute which means "a discharge of a pollutant" (§502(6)), and "pollutant" is expressly defined to include heat (§502(6)). The disposal of heat may have an effect on plankton, fish, shellfish and wildlife, and may result in changes in marine ecosystem diversity, productivity and stability and species and community population changes. In cases where 316(a) waivers are obtained, Section 403 largely duplicates

§316(a); however, in cases where a 316(a) waiver has not been obtained, but 301 or 306 standards apply, Section 403 would not be duplicative.

I believe that, for me to disregard the plain meaning of the statute, there should be clear legislative history indicating a contrary meaning, and that is not the case here. The Conference Report stated that Section 403 regulates "the discharge of pollutants subject to this Act" (which term, as discussed above, includes discharges of heat) from any "outfall sewer" (Legis. Hist. at 177). PSCo urges that the term "outfall sewer" does not include a thermal discharge such as Seabrook's. Though the Conference Committee may have had in mind that Section 403 would regulate principally discharges of industrial and sanitary waste, casual use of the term "outfall sewer" is insufficient to indicate an intent to exclude pollutants other than chemical and sanitary wastes.

The Senate Committees on Commerce and Public Works had competing jurisdictional claims in the areas covered by Section 403 of the Senate version of FWPCA and H.R. 9727, an ocean dumping bill. Senator Magnuson stated that Section 403, coupled with Section 502(n) (which defined "discharges" basically in the same manner discussed above), accurately reflects the agreement of these Committees as to the two bills—that is, the Committee agreed that "the regulation of discharges of pollutants" within the territorial and internal waters of the United States will be governed by the provisions of the Senate version of FWPCA and in areas beyond that "the regulation of transportation for dumping of materials originating in the United States" will be governed by H.R. 9727.

(Legis. Hist. at 1380). The Senator carefully distinguished between regulation of "dicharges" and regulation of "dumping." Senator Hollings concurred that "the discharge of pollutants from outfalls, vessels or any other source" within the internal or territorial waters of the United States would be governed by the proposed FWPCA amendments and that "the regulation of such discharges will be through a permit program, applying discharge criteria provided in Section 403 of the act." (Legis. Hist. at 1381; emphasis added).

PSCo also argues that because of the "clear complementary relationship" between Section 403 and the ocean dumping statutes it can be inferred that disposition of the same sorts of materials were to be prohibited; since the ocean dumping statute does not prohibit dumping of heat, PSCo argues, therefore Section 403 must not. Leaving aside the question of whether such a mode of statutory interpretation is valid, the short answer is that one would not expect an ocean dumping statute to cover heat because heat is discharged through pipes and is not transported on a vessel for ocean disposal. In conclusion, I believe that Section 403 applies to discharges of heat.

Upon review of the record in this case and of appropriate portions of the Final Environmental Impact Statement issued by the AEC in December, 1974, I have determined that PSCo's requested thermal discharge would be "in the public interest" within the meaning of Section 403(a).

B. Motion of PSCo Regarding EPA Brief

On February 14, 1977 PSCo filed a Motion for

Enforcement of Administrator's Order or, For Alternate Relief, requesting that the brief of the Environmental Protection Agency be stricken and that the Proposed Findings and Conclusions of EPA Enforcement Division - Region I and EPA, Office of Water Enforcement, be substituted therefore.

The Proposed Findings are in the record and the record indicates the position taken by the Enforcement Division on behalf of the Agency at the adjudicatory hearing. Properly speaking, it is the Agency, not the Enforcement Division, which took part in the proceedings below. On Appeal, the Agency determined that its brief was to be filed by its Office of General Counsel. It is for the Agency to determine by whom it will be represented. The motion is denied.

C. Filing of Reply Briefs and Brief of Governor of New Hampshire

On February 11, 1977 the Utilities filed a request to file a reply brief, accompanied by that brief. SAPL objects to the filing of the brief and to the manner in which the request was made. It has been past practice of the Judicial Officer to permit the filing of reply briefs as a discretionary matter, though the filing of reply briefs is not specifically authorized in the regulations. The filing of the request concurrent with the brief was specifically authorized by the Judicial Officer in this case. Because of the complexities of this case, I felt it was useful to permit the filing of reply briefs, and accordingly the requests of the Utilities and PSCo in this regard are hereby granted. The brief by the Governor of New Hampshire was timely filed in accordance with the notice granting him permission to file an amicus brief.

D. Denial of Request for Hearing

On March 23, 1977 I issued a Request for Information from PSCo and gave the other parties an opportunity to furnish comments on PSCo's submission within 10 days from the date of submission, in affidavit form. I also stated that a hearing with respect to PSCo's submission might be held upon the request of any party upon a showing, among other things, that there was a genuine and substantial issue of fact for resolution at a hearing and that such factual issue was capable of being resolved by available and specifically identified reliable evidence; I stated that a hearing would not be granted on the basis of mere allegations or denials or general descriptions of positions and contentions.

As mentioned above, materials were received in response to the Request for Information from NHAG, PSCo, EPA and SAPL. SAPL requested a hearing. Upon review of SAPL's request I find that it does not meet the criteria specified in the Request for Information. SAPL has not identified genuine substantial issues of fact for resolution at a hearing by specifically identified reliable evidence. It has merely made general allegations about issues which appear to be adequately dealt with on the record to date. For instance, the accuracy of larval identification was the subject of exhaustive testimony in the hearing below, and SAPL does not indicate that it has new evidence on this point. SAPL does not identify any substantial issue which it has not dealt with, or had the opportunity to deal with, in the case below or in its written submission. I am not persuaded by SAPL's request that a hearing would be of assistance to me in resolving the underlying issues in this case. In view of

the need for an expeditious resolution of this case and the failure of SAPL to state a basis for holding further hearings in accordance with the criteria set forth in my Request for Information, I am hereby denying SAPL's request for a hearing.

Accordingly, as indicated above, the Initial Decision of the Regional Administrator is reversed. The Determinations are reinstated, except that Condition I(C)(2) requiring "no measurable rise" at the Inner or Outer Sunk Rocks shall be promptly modified by the RA in accordance with this decision. I direct the RA to consider also modification of the Determinations to impose additional conditions as mentioned in this Decision.

Douglas M. Costle
Administrator

FN1. It was determined by the RA that Seabrook Station is not a new source and this determination was not Appealed.

FN2. A Legislative History of the Water Pollution Control Act Amendments of 1972, ("Legis. Hist.") 93rd Cong., 1st Session, p. 264.

FN3. Decision of the General Counsel on Matters of Law No. 41, Issue No. III, June 1, 1976.

FN4. Scenic Hudson Preservation Conference v. FPC, 354 F.2d 608, 620 (2d Cir. 1965), cert. denied, 384 U.S. 941 (1966) (Scenic Hudson I).

FN5. Draft 316(a) Technical Guidance—Thermal Discharges, September 30, 1974 p. 7.

FN6. The difficulty of precisely modeling the "whole ecosystem" increases exponentially with the number of species in the system. Thus, while it is possible to model a system of, say, five species which interact with each other, this task becomes extremely difficult with most natural systems. The reason is that most systems are comprised of hundreds or thousands of species; the possible interactions are astronomical.

FN7. The regulations make it clear that the granting of a 316(a) request after a RIS demonstration is permissive and not mandatory (40 CFR §122.9(a) (2) and (b) (i)). Morever, 40 CFR §122.9 (b)(2)(iii)(A) provides that "in determining whether or not the protection and propagation of the representative, important species will be assured the Regional Administrator may consider ... any additional information submitted by the owner or operator or required by the Regional Administrator." (Emphasis added.) Thus, in appropriate cases the Regional Administrator may request information beyond that furnished in the normal RIS demonstration.

FN8. The legislative history indicates that mixing zones are to be considered under 316(a). Legis. Hist. at 264, 167.

FN9. I wish to make clear that the amount of data sufficient for 316(a) demonstration in one case may not be sufficient in another case. The degree to which data are required on all life stages of RIS depends to some degree on the situation being examined. The less the

magnitude of the risk, the less certain the evidence should have to be in order to allow the risk and vice versa. For example, if either the proposed discharge or intake sites were within an enclosed area (such as Hampton Harbor), comprehensive and complete thermal effects data on appropriate RIS would be necessary.

1 E.A.D. 332, 1977 WL 22370 (E.P.A.)
END OF DOCUMENT

Docket OW-2002-0049 DCN# 6-4075
Science Applications International Corporation (SAIC)
Preliminary Regulatory Development, Section 316(b) of the Clean Water Act, Background Paper Number 1: Legislative, Regulatory, and Legal History of Section 316(b)

PRELIMINARY REGULATORY DEVELOPMENT SECTION 316(b) OF THE CLEAN WATER ACT

BACKGROUND PAPER NUMBER 1: LEGISLATIVE, REGULATORY, AND LEGAL HISTORY OF SECTION 316(b) AND INFORMATION ON FEDERAL AND STATE IMPLEMENTATION OF COOLING WATER INTAKE STRUCTURE TECHNOLOGY REQUIREMENTS

APRIL 4, 1994

Prepared for:

U.S. Environmental Protection Agency
Office of Wastewater Enforcement and Compliance
Permits Division
401 M Street S.W.
Washington, D.C. 20460

Prepared by:

Science Applications International Corporation
7600-A Leesburg Pike
Falls Church, VA 22043

EPA Contract No.: 68-C8-0066; WA# C-5-55(P)
SAIC Project No.: 01-0833-03-6957-001

1. INTRODUCTION

The office of Wastewater Enforcement and Compliance (OWEC) of the U.S. Environmental Protection Agency (EPA) recently tasked Science Applications International Corporation (SAIC) with developing a summary of the legislative, regulatory and legal history surrounding the development, implementation, and enforcement of requirements under §316(b) of the Clean Water Act (CWA).[1] The purpose of this paper is to provide EPA with pertinent background information as the Agency begins consideration of future regulatory activity under CWA §316(b). This paper presents an initial synthesis of the legislative, regulatory and legal history of CWA §316(b) and information on implementation of CWA §316(b) requirements. Because of SAIC's inability to locate certain primary documents, some of the information in this paper was gathered from secondary sources. When a secondary source has been used, this source has been cited.

The CWA establishes the general rule that the discharge of a pollutant from any point source is prohibited unless authorized by a permit. Under CWA 1402 and regulations set out in Title 40 of the *Code of Federal Regulations* (*CFR*) Parts 121-125, EPA or a State with an EPA-approved program may issue a National Pollutant Discharge Elimination System (NPDES) permit authorizing a pollutant discharge if the discharge meets the requirements of the CWA, including CWA §301 effluent limitations and CWA §306

---

[1] 33 U.S.C. §§1251-1387 (1988). In this paper, the acronym "CWA" is used as a general term when referring to the statutory authority for the National Pollutant Discharge Elimination System program.

new source performance standards. Pursuant to the definition of "pollutant" in CWA §502(6), heat is a pollutant regulated under the CWA, bringing thermal discharges under the coverage of the NPDES program requirements. According to procedures set out in CWA §316(a), thermal effluent limitations established under CWA §§301 or 306 may be modified to a less stringent level if it can be shown that the modified levels are sufficient to protect a balanced indigenous population of fish, shellfish, and wildlife. CWA §316(b) mandates that any standard established by EPA pursuant to CWA §301 or CWA §306 and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts.

This paper is organized into five major sections. Section 2 discusses the legislative history of CWA §316(b). Section 3 provides a summary of the corresponding regulatory history. Section 4 presents information regarding legal interpretations of CWA §316(b) requirements. Section 5 provides information regarding how CWA §316(b) requirements have been implemented by the EPA Regions and States with EPA-approved NPDES programs (NPDES States). Finally, Section 6 proposed future steps to expand upon the information presented in this paper.

2. CWA §316(b) LEGISLATIVE HISTORY

2.1 Introduction

This section summarizes the legislative history of CWA §316(b). The discussion addresses Congressional motivation and intent, viewpoints of interested parties relative to the CWA §316(b) debate, the legislative

proposals and related negotiations, and the final conference report and CWA §316(b) compromise. Finally, this section concludes with a brief summary of the legislative activity regarding CWA §316(b) subsequent to passage of the FWPCA. Appendix A sets out those documents reviewed to compile the information in this section and briefly summarizes relevant coverage in each document.

In addition, this section presents historical legislative information regarding CWA §316(a). In general, the legislative history surrounding CWA §316 is focused on the control of thermal discharges. Thus, much of the legislative history addresses issues related to the control of the discharge of heat from power generating facilities. The issue of the design of cooling water intake structures was addressed in the context of the overall adverse environmental impact of the operation of the facilities in question. CWA §316(b) essentially was created as a result of compromises regarding statutory approaches to control thermal discharges.

To gather the information presented in this section, SAIC reviewed a variety of primary and secondary sources. Primary sources consisted of Congressional hearing transcripts and legislative history compilations prepared by the Environmental Policy Division of the Congressional Research Service of the Library of Congress or by EPA. Copies of primary sources were obtained from the EPA Headquarters Main and Legislative Libraries, the EPA Region V Library, the Library of Congress, and the libraries of both George Mason University and George Washington University. Secondary sources included books on the history of Federal water pollution regulation, environmental law

treatises, and law review and other articles identified through research. Information on current legislative proposals was gathered through review of the proposed bills and informal discussions with Congressional committee staff.

2.2 Nature of the Thermal Pollution Problem

Thermal pollution appears to have emerged as a critical water protection issue during the late 1960s.[2] Control of thermal discharges had not been addressed in the two major water legislative initiatives of that decade, the Water Quality Act of 1965 (P.L. 89-234) and the Clean Water Restoration Act of 1966 (P.L. 89-753). At that time, power plants, especially nuclear power facilities, were recognized as major water users and principal sources of thermal pollution. No Federal agency possessed adequate authority to prevent or control thermal pollution from such facilities. The Atomic Energy Commission (AEC), which was responsible for licensing nuclear power plants, claimed that it did not possess authority to consider thermal pollution when reviewing license applications.[3] It was

---

[2] Clarence Davies III, *The Politics of Pollution* (New York: Pegasus, 1970), pp. 38-49. During the late 1960s, Congress began consideration of a series of pollution problems not addressed by the 1965 Water Quality Act and the 1966 Clean Water Restoration Act. Thermal effluent was one of the pollution issues considered. Also evaluated were such issues as oil pollution, acid mine drainage, eutrophication, , and vessel pollution. The bills proposed during the late 1960s to amend the Water Pollution Control Act (P.L. 80-845) addressed these topics. Both oil and thermal pollution were the most controversial of the issues covered.

[3] *Id.* at 46-47. As a result of passage of the National Environmental Policy Act (NEPA) in 1969 and its subsequent interpretation in *Calvert Cliffs, Coordinating Committee, Inc. v. Atomic Energy Commission*, 1 ELR 20346 (July 23, 1971), the

in this context that Congress sought to address the issue of the control of thermal pollution.

2.3 Legislative Attempts to Address Thermal Pollution in the 90th Congress

Between 1967 and 1970, Congress attempted to address the gap in regulatory authority to control thermal pollution. Extensive hearings were held on the issue during this period. In July 1968, Senator Edmund Muskie proposed language in S. 2525 to amend Section 11 of the Water Pollution Control Act that would mandate the consideration and control of thermal pollution. Under this proposal, all Federal agencies that carried out or issued leases, licenses or permits would be required to cooperate with the Secretary of Interior by certifying that authorized activities would not violate applicable water quality standards.[4] Thermal discharges were implicitly covered under this provision since a water quality standard was in place at the time for heat.

The "Section 11" proposal raised considerable controversy, facing opposition from within Congress,

---

AEC began considering the environmental consequences of nuclear power plant operations at various stages of the licensing process. These activities led to an assessment of the environmental consequences of thermal effluent from nuclear power facilities. NEPA imposed a duty upon all Federal agencies to: (1) consider the effects of their decisions and activities upon the environment and to use whatever practicable means available to avoid environmental degradation and (2) follow procedural guidelines for ensuring that the substantive goals of NEPA were met. In *Calvert Cliffs*, the D.C. Circuit held that AEC was required to revise its rules governing the consideration of environmental issues.

[4] *Id.* at 47.

from the regulated community, and from the Executive Branch. Opposed to the provision were electric utilities and the Chamber of Commerce. The Army Corps of Engineers opposed interference with respect to its licensing of dumping and dredging material from rivers and harbors. The AEC defended the interests of the nuclear power, as well as overall electric utility industry.[5]

The House version of the Senate bill to amend the Water Pollution Control Act deleted the Senate's Section 11 provision. Rather than negotiate with the Senate through a conference committee, the House elected to seek Senate approval of its bills. Senator Muskie, however, refused to compromise on the Section 11 language. The Senate, in turn, passed a revised House bill restoring the revised Section 11. In the closing hours of the 90th Congress, the House agreed to a series of the Senate's technical amendments, but continued to delete the Section 11 revisions. The Senate did not respond to the House's latest action before the close of the 90th Congress. Thus, the session ended without legislative action on water pollution control.

2.4 Legislative Attempts to Address Thermal Pollution in the 91st Congress

Both the Senate and the House introduced similar legislation as produced in the 90th Congress during the 1969 91st Congress and held a number of committee hearings. Senator Muskie rewrote his version of Section 11 to shift responsibility for certification. Specifically, the language required applicants for a

---

[5] *Id.*

Federal license or permit to obtain a certificate from the appropriate state agency indicating that activities authorized under the license or permit would not violate water quality standards. The House incorporated the revised Muskie language in its reintroduced bill, H.R. 4148. The Senate reported out a revised bill, and both were sent to a conference committee. In March 1970, the conference reported H.R. 4148; Section 11 was redesignated as Section 21, entitled "Cooperation by all Federal Agencies in the Control of Pollution." New Section 21(b) incorporated Senator Muskie's certification scheme, requiring State certification that a proposed discharge into navigable waters would not violate applicable water quality standards. The Senate agreed to the conference report on March 24, 1970, the House on March 25, 1970. On April 3, 1970, H.R. 4148 was approved as the "Water Quality Improvement Act of 1970" (P.L. 91-224).

2.5 Legislative Activity to Address Thermal Pollution in the 92nd Congress

In the 92nd Congress, the Water Pollution Control Act was finally amended to address thermal pollution and the technology of cooling water intake structures. The current version of CWA §316 resulted from a compromise regarding the regulatory schemes presented in House Bill 11,896 and Senate Bill 2770. CWA §316 has not been amended to date by subsequent legislation. This section summarizes the proposed House and Senate versions of CWA §316 and discusses issues related to the compromise version that resulted.

2.5.1 Summary of Proposed House Bill 11,896

The House version of CWA §316 was designed to regulate both the discharge of thermal pollution and cooling water intake structures at facilities discharging heat and would have presented a different approach from that used under the current CWA §316. Essentially, the House Bill would have incorporated cooling water intake structure regulation into the control of thermal discharges.

Under H.R. 11,896, thermal discharges were treated as a special type of pollutant. The House definition of pollutant included "heat" but not "thermal discharges in accordance with regulations issued pursuant to Section 316 of the Act."[6] This language allowed for the special regulation of thermal discharges. No uniform national technology standards for cooling water intake structures would have been established. Instead, H.R. 11,896 would have required EPA to develop regulations for the control of thermal discharges within one year of the statute's enactment that would "recognize that the optimum method of control of any thermal discharge may depend upon local conditions, including the type and size of the recovering body of water."[7] The House Bill would have mandated that EPA regulations require members of the regulated community to complete a process, similar to an environmental impact statement under

---

[6] H.R. 11,896, 92d Cong., 2d Sess. (1972), *reprinted in* SENATE COMM. ON PUB. WORKS, 93D CONG., 1ST SESS., A LEGISLATIVE HISTORY OF THE WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972, at 1068 (1973) [hereinafter LEGISLATIVE HISTORY].

[7] *Id.* at 1043-45.

NEPA, to determine appropriate facility controls to minimize the effect of the given facility's discharge.[8] The House Bill would have provided that:

> [t]he regulations shall require any person proposing to make such a [thermal] discharge to consider all alternative methods for controlling such a discharge, involving, but not limited to (1) utilization of available water bodies or cooling devices, including once-through cooling, mixing zones, cooling ponds, spray ponds, evaporative or non-evaporative cooling towers, (2) dilution of heated waters with cooler waters, and (3) an alternation of the outlet configuration.[9]

By specifying these potential methods, the House Bill incorporated cooling water intake structure regulation into the provision for the control of thermal discharges. The proposed legislation also would have required that both EPA and the facility consider the above potential methods completely before a cooling water intake structure system could be utilized; in choosing among the possible technologies, EPA and the facility were to consider:

> (1) their relative engineering and technical feasibility, (2) their relative social and economic costs and benefits, (3) their relative impact on the environment, considering not only water quality but also air quality, land

---

[8] *See* Karl R. Rábago, *What Comes Up Must Go In: Cooling Water Intakes and the Clean Water Act*, 16 HARV. ENVTL. L. REV. 429, at 447 (1992).

[9] H.R. 11,896, *supra note* 6, at §316(a), *reprinted in* LEGISLATIVE HISTORY, *supra* note 6, at 1043-45.

> use, and effective utilization and conservation of natural resources, and (4) methods of minimizing adverse effects and maximizing beneficial effects of such discharges.[10]

The House Bill also included a different approach to variances. Under the House version of CWA §316, variances to thermal discharge limitations could be granted when the economic and social costs of these limitations bore no reasonable relationship to the economic and social benefits.[11] In determining whether a variance was to be granted, EPA would have been required to compare all social costs, not only economic ones, to all benefits. In instances where the costs bore no reasonable relationship to the benefits, EPA could have permitted an "appropriate adjustment" consistent with the greatest degree of control reasonably achievable. This approach to variances from thermal discharge regulations differed from the method prescribed by the House in its proposed CWA §301 for other types of discharges. Under proposed CWA §301, a variance could be granted in situations where a facility could illustrate that it could not attain compliance "at a reasonable cost."[12]

Overall, the proposed House Bill would have allowed for regulation of cooling water intake structures through regulations that would have granted individualized consideration of facility differences and for some modification of regulatory requirements on a site-by-site basis without sacrificing maximum achievable control. The House version

---

[12] H.R. 11,896, *supra* note 6, at §301(b)(2)(A), *reprinted in* LEGISLATIVE HISTORY, *supra* note 6, at 964.

would have required each steam electric generating facility with thermal discharges to engage in a full environmental impact assessment of the ecosystem, the facility itself, and the entire range of alternative technologies, including retrofit of intake and discharge structures.

2.5.2 Summary of Proposed Senate Bill 2770

The Senate Bill[13] addressing water pollution control contained no provisions specifically addressing thermal discharges or significantly affecting the choice of cooling water intake structure technology. Like its House counterpart, the Senate version included heat in its definition of a pollutant; however, unlike the House Bill, there was no exemption from coverage of thermal discharges that were in compliance with more specific discharge limitations. Thus, under the Senate, thermal discharges would be regulated like any other pollutant.

In addition, the Senate approach did not require consideration of alternatives or mitigation measures that might influence the choice of cooling water intake structure technologies. Instead of requiring the consideration of intake effects as a component of thermal discharge regulation, the Senate version would have mandated the establishment of general discharge standards; under this approach, EPA could develop a site-by-site approach to regulating cooling water intake structures. Thus, cooling water intake structures would have only been regulated as an indirect result of

---

[13] S.2770, 92d Cong., 1st Sess. (1971), *reprinted in* LEGISLATIVE HISTORY, *supra* note 7, at 1534.

the Senate Bill's regulation of technologies used to control thermal discharges. [14]

2.5.3 Conference Compromise

When the two bills moved to Conference Committee, the issue remained as to whether thermal discharges were sufficiently unique to justify their own regulatory regime, as in the House Bill, or whether they should be treated as any other pollutant subject to the CWA's general limitations and guidelines, as in the Senate Bill. The method of control of cooling water intake structure effects was affected by each approach. Under the House approach, the consideration of harmful intake effects would have been a component of thermal discharge regulation. Conversely, the Senate Bill did not directly address cooling water intake effects.

The version of CWA §316 that was finally adopted incorporated the Senate's basic approach to control of thermal discharges. Heat remained a pollutant in the CWA definitions section; however, the consideration of intake alternatives or mitigation measures was not required for the issuance of an NPDES permit to discharge heat. Little explanation in the formal conference report or in the debates surrounding the final version of the amendments offers insight into the reasons behind the compromise. [15]

The final version of CWA §316 required a two-pronged approach to the regulation of thermal discharges and cooling water intake structures. First,

---

14 *See* Rábago, *supra* note 8, at 453.

15 See S. REP. No. 1236, 92d Cong., 2d Sess. (1972), *reprinted in* 1972 U.S.C.C.A.N. 3776.

an NPDES permit for a facility discharging heat must require compliance with effluent limitations developed pursuant to CWA §301 or new source performance standards developed under CWA §306; however, CWA §316(a) allows a facility to seek a variance from strict application of CWA §301 or CWA §306 requirements. To obtain such a variance, the facility must show that the proposed limitation is "more stringent than necessary to assure the [protection] and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made...." Upon such a showing, EPA is authorized to impose a less stringent thermal limitation if it is determined that the ecological balance is maintained.

Because CWA §§301 and 306 address pollutant discharges only, a separate provision specifically addressing cooling water intake structure technology was needed. Thus, CWA §316(b), the only section of the CWA dealing exclusively with intakes, states that

> [a]ny standard established pursuant to section 301 or section 306 of this Act and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures; reflect the best technology available for minimizing adverse environmental impact. [16]

Through this provision, Congress created another technology standard, the "best technology available" (BTA) standard, for dealing with cooling water intake structures. The only legislative history that addresses the subject indicates that BTA should be interpreted

---

[16] U.S.C. §1326(b).

as "best technology available commercially at an economically practicable cost."[17] The BTA standard is to be applied whenever a cooling water intake structure is used at a facility subject to NPDES permitting requirements.

2.6 Subsequent Legislative Activity Regarding CWA §316(b)

The CWA was amended in 1977[18], 1981[19], and 1987[20], with no revisions being made to CWA §316. In the current CWA reauthorization process, one bill would have deleted §316(b), while the most current proposals leave the provision in place.

In past legislative debate on CWA amendments, some emphasis was placed on revising the CWA §316(b) requirements. In 1982, EPA proposed to Congress revisions to create two CWA §316(b) standards, one for new sources, and another for existing sources.[21] Under the EPA proposals, new

---

[17] *See* 118 CONG. REC. 33,762 (1972), *reprinted in* LEGISLATIVE HISTORY, *supra* note 6, at 264 (Statement of Representative Don H. Clausen).

[18] Clean Water Act Amendments of 1977, Pub. L. No. 95-217, 91 Stat. 1566 (1977))

[19] Clean Water Act Amendments of 1981, Pub. L. No. 97-117, 95 Stat. 1631(1981))

[20] Clean Water Act Amendments of 1987, Pub. L. No. 100–4, 101 Stat. 7 (1987)

[21] *Clean Water Act Amendments of 1982: Hearing on S.777 & 2652 Before the Subcomm. On Environmental Pollution of the Comm. on Environment and Public Works*, 97th Cong., 2d Sess. 279, at 318-19 (1982). EPA also proposed three modifications to the variance provisions in §316(a). First EPA proposed that the CWA should permit EPA to grant a thermal variance upon a showing that the discharge would cause no impairment to the

sources would still have to utilize the best technology available for minimizing adverse environmental impact. Existing point sources could satisfy CWA §316(b) by applying either the best technology available or "other equally effective measures" that alone or in combination with "best available technology" would minimize adverse impact.[22]

EPA testimony indicated that the Agency felt that the requirements of CWA §316(b) were too stringent. The Edison Electric institute (EEI) argued that CWA §316(b) allowed EPA to conclude that adverse intake effects could be minimized only by means of technical modifications to location, design, construction, or capacity of intake structures. EEI sought clarification of whether minimizing adverse impacts might also be accomplished through non-intake structure responses, such as fish hatcheries or stocking programs. Despite this testimony and relatively mild objection to change from environmental groups,[23] Congress did not revise CWA §316 in 1982.

Congress has over the past two sessions addressed CWA reauthorization. Senate Bill 1081, proposed in the last Congressional session, would have deleted CWA §316(b) and designated the provision as being "reserved." The current Senate reauthorization bill, S.1114, would leave CWA §316(b) as is. A House bill

---

water quality standards established by the states. Second, EPA proposed that the CWA should permit EPA to grant a variance upon a showing that a balanced population of shellfish, fish, and wildlife would remain in and on the water. Third, EPA proposed that the CWA should allow a State to make the determination of balanced population. These proposals were not adopted.

22 *Id.*

23 See Rábago, *supra* note 8, at 473.

was recently introduced in March 1994 (The Water Quality Act of 1994, H.R. 3948); preliminary research has indicated that this proposal would not revise CWA §316(b).

* * *

5. EPA REGIONAL AND NPDES STATE IMPLEMENTATION OF CWA §316(b) REQUIREMENTS

5.1 Introduction

Although EPA has not promulgated regulations under CWA §316(b) setting standards for cooling water intake structures, standards related to the design and operation of such structures have been included in NPDES permits issued by the EPA Regions and NPDES States. As a result, the Regions and NPDES States have played a large role in the development of regulatory standards related to cooling water intake structures. As EPA is considering formally addressing this issue by regulation, having a perspective on Regional and State activity, and the strengths and weaknesses of such approaches, could assist in this endeavor.

This section addresses three major topics. First, the section summarizes information gathered regarding EPA Regional implementation of CWA §316(b) requirements through EPA issued NPDES permits. Second, the section presents information on how NPDES States have approached the regulation of cooling water intake structures. Finally, the section summarizes preliminary data obtained regarding the status of CWA §316(b) determinations made in the EPA Regional and NPDES State permitting programs.

5.2 EPA Regional Activities Regarding CWA §316(b) Implementation

To gain an understanding of how CWA §316(b) is being implemented in the EPA Regions, SAIC conducted an informal survey. Representatives familiar with the CWA §316(b) activities in each Region were first identified. A list of the identified EPA Regional representatives is provided in Appendix G. Representatives from each of the 10 EPA Regions were then sent letters via telefax informing them that they were going to be contacted and outlining the types of information that would be asked of them. Each representative was then contacted by telephone and information was requested regarding:

- Major CWA §316(b) determinations made in the Region and whether they were based on previous determinations and/or whether they served as the basis for subsequent determinations
- Facilities other than steam electric which were required to demonstrate compliance with CWA §316(b)
- Major technologies used in the Region to "minimize adverse environmental impacts" and any information on operational characteristics, efficiency, and frequency of use of these technologies
- Existing list/inventories of CWA §316(b) determinations made in the Region
- Whether technological modifications/fixes had been required as a result of determinations made in the Region

- Available reports or other documentation from Regional CWA §316(b) determinations.

Responses to the request for information were limited. The low response rate could be attributed to the fact that the phone calls were initially made at the end of the government's fiscal year when workloads are generally higher than usual. Some of the Regional representatives contacted stated that they just did not have the time to put towards researching the information needed. Many of the representatives, however, did not have the information available to them because CWA §316(b) requirements were being implemented by NPDES States in their Regions. Additional calls made to several of the Regions after the start of the new fiscal year did not yield any additional information. The data collected as a result of the informal Regional survey are summarized below. Responses to the questions are presented below in sequential order by EPA Region.

Region I

EPA Region I has made the following major CWA §316(b) determinations for steam electric facilities:

- Seabrook Station (Public Services Company of New Hampshire)
- Pilgrim Station (Boston Edison Company)
- Brayton Point Station (New England Power Company).

In addition, several smaller steam electric facilities with generating capacities of less than 100 Megawatts (MW) have been required to demonstrate compliance. No other industries beyond steam electric have been

required to show compliance with CWA §316(b) requirements.

Determinations made with respect to the Seabrook Station in New Hampshire set the precedent for several subsequent CWA §316(b) determinations. The decision for the Brayton Point Station required modifications to the screens. This decision was based on a determination made at the Indian Point Facility in New York.

In general, fish return systems have been required at all steam electric plants in Region I to minimize aquatic and environmental impacts. Other technologies required under CWA §316(b) have included the following:

- At the Seabrook Station, long intake tunnels which allow the facility to withdraw cooling water from an area where it will cause less environmental impact and that are outfitted with vertical mid-depth openings and velocity caps have been required.
- At the Brayton Point Station, slant screens with a pumped fish return have been required.
- At the Mystic Station (Boston Edison Company), sills have been required in front of the intake structure to deter flounder.

The intake control technology that was required at the Seabrook Station has reduced impingement of that facility to only 1,000 fish per year. Region I has documentation of additional operational characteristics, efficiencies and frequency of use for control technologies at Seabrook and other facilities.

There are no lists or inventories of CWA §316(b) determinations available in the Regional office. In

addition, the Region does not have reports for past determinations.

Region II

EPA Region II has made the following major CWA §316(b) determinations:

- Indian Point (Power Authority of State of New York)
- Half-Moon Station (Inter-Power of New York).

Other determinations were probably made in the 1970s and 1980s; however, such information was not provided or available at the time of the interview. Facilities other than steam electric have not been required to demonstrate compliance with CWA §316(b) requirements.

The Indian Point facility in New York was required to provide modified Ristroph traveling screens, a low pressure wash system, a fish return, and a fish hatchery. The facility may also have been required to install a sound barrier. No information is available in Region II's records documenting operational characteristics, efficiencies and frequency of use of the technologies required.

The representative contacted indicated that he would send additional information on the CWA §316(b) activities; however, no information has been received to date.

Region III

The representative contacted in Region III stated that the States have been making CWA §316(b) reviews and determinations for at least 10 to 14 years with little or no Regional oversight. A determination was made for the Eddy Stone Power Plant

[Philadelphia Electric Co. (PA)] approximately five years ago; however, the details of the determination were unknown to the EPA Regional representative except that the determination was based on the State of Pennsylvania's criteria for best technology available at the time. Few if any of the CWA §316(b) determinations in the Region have required modification of existing intakes.

Industries other than steam electric have not been required to demonstrate compliance with the requirements of CWA §316(b) in the Region.

There are no inventories or other information available in the Region III office on the status of CWA §316(b) activities.

Region IV

EPA Region IV has made the following major CWA §316(b) determinations for steam electric facilities. The name of the facility, the date of the determination and the intake modification/mitigation measures are provided:

- Northside Power Plant, Jacksonville Electric Company, FL, February 17, 1977. Intake modification/mitigation measures: installation of return mechanism for impinged organisms.
- Brunswick Steam Electric Plant, Carolina Power & Light Company, NC, November 11, 1977. Intake modification/mitigation measures: reduction of intake flows at certain times, installation of fixed screens at the mouth of plant intake canal, installation of fine mesh screens at the plant intakes, and installation of an impinged organism return system.

- Big Bend Station, Tampa Electric Company, FL, June 12, 1981. Intake modification/ mitigation measures: installation of fine screens on Units 3 (retrofit) and 4 and an impinged organism return system; dilution pump use was discontinued.
- Crystal River Power Plant, Florida Power Corp., FL, September 1, 1988. Intake modification/mitigation measures: reduction in intake flows at certain times and installation of a fish hatchery and program of restocking.
- John Sevier Power Plant, Tennessee Valley Authority, TN, April 15, 1986. Intake modification/mitigation measures: Fish restocking program.

Several of the determinations made in Region IV have been based on other determinations made within the Region or in other Regions. They are as follows:

- The mitigation measures provided for the Brunswick Steam Electric Station were based in part on prototype studies of fine mesh screens at the Big Bend Station
- The Crystal River mitigation measures were based in part on the Seabrook and Brunswick decisions.
- The Regional determination that the intake dam at the John Sevier Power Plant is a component of the plant intake structure may set a precedent (although the determination was not adjudicated or litigated) for sites where a dam has been constructed across the intake water body to produce an intake impoundment.

In addition to requirements for the steam electric industry to demonstrate compliance with CWA §316(b) requirements, at least one steel mill was required to conduct a CWA §316(b) study; however, the permit was adjudicated and no knowledge is available as to whether the study was ever actually conducted.

Intake technologies used to reduce impacts in Region IV have included the following. Facilities where these technologies have been installed are also provided:

- Fine mesh screens: Big Bend and Crystal River Stations.
- Impinged organism return systems: Big Bend, Brunswick, and Northside Stations.
- Offshore ocean intake with a velocity cap: St. Lucie Nuclear Power Plant, Florida Power and Light Company, FL.
- Johnson screens (in cooling to intake system): Seminole County Power Plant, Seminole Electric Company, FL.
- Submerged, offshore, perforated pipe to an onshore intake structure (in cooling tower intake system): East Bend Station, Cincinnati Gas & Electric Company, KY.
- Submerged weir (to intake water from deeper and generally less productive portions of the intake water body): Numerous Tennessee Valley Authority and Duke Power Company plants.
- Fixed screen at the mouth of the intake canal: Brunswick Steam Electric Plant.
- Infiltration wells (to eliminate the direct use of a water intake from a surface stream): Grand Gulf

Nuclear Station, Systems Energy Resources, Inc., MS.

- Reduced flow during portions of the year: Anclose Power Plant, Crystal River Power Plant, and Brunswick Nuclear Plant.

Mitigation measures that have been required where technology is insufficient or wholly disproportionate in cost include: fish hatchery and/or restocking programs such as that implemented at the Crystal River and John Sevier Stations.

Information available from Region IV on the operational characteristics, efficiencies, and frequencies of use of these technologies is as follows:

- At the Big Bend Station, survival of returned organisms at: (1) average survival all eggs and larvae is approximately 75 percent, (2) crustacean survival is 90+ percent, and (3) various species of drum were at best 50 percent.
- With the exception of intake flow reduction (required only at specified times), generally, all cooling water intake facilities are operated continually.

Region IV has an updated inventory of CWA §316(b) activities which is based on the Utility Data Institute study conducted for EPA in 1981. A preliminary update of the Inventory is provided in Appendix H of this document. This update, however, remains to be verified by the Regional representative. Additional CWA §316(b) historical information covering EPA Region IV and other Regions may be available from the Region IV representative.

Region V

The representative contacted in Region V believes that no CWA §316(b) determinations have been made in the Region since 1988; however, Michigan has several studies currently underway. Historical information on CWA §316(b) was not available because the files were destroyed in the late 1970s.

In addition to requiring determinations at steam electric facilities, Region V has required studies at steel mills; however, modifications to the intakes have never been required.

Intake technologies used to reduce impacts in Region V have included: (1) nets installed at the mouth of the intake canal at the Pulliam Station, WI Public Service Corporation, and Quad Cities Station, Commonwealth Edison Company, IL; and (2) Johnson Screens (offshore) installed at the Campbell Station, Consumers Power Company, MI. No information on the operational characteristics, efficiencies, and frequency of use of these technologies was available from the Region. In general, it is known that no major modifications have been required on existing intake structures in the Region.

There are no inventories available in the Regional program office on the status of CWA §316(b) activities. There are numerous studies, reports and determinations available, however, in the Region V library on CWA §316(b) determinations made in the area of the Great Lakes. In particular, there is a detailed report on Lake Michigan cooling water intake structures.

Region VI

No information was provided by the Region VI representative at the time of the interview. Information was promised after September 30, 1993. To date, no information has been received. Follow-up calls have not yet been made.

Region VII

The Gerald Gentlemen Station, Southerland Reservoir, Nebraska Public Power District is the only facility where Region VII has required modifications. The Regional representative believed that only changes in operational procedures were required at the facility. This determination was made by the Nebraska Department of Environmental Quality.

No industrial facilities other than steam electric have been required to conduct CWA §316(b) demonstrations.

Region VIII

Information was unavailable from the Region VIII representative. To his knowledge, there has been no work conducted on CWA §316 since the early 1970s, nor have there ever been any CWA §316(b) studies conducted.

Region IX

The representative contacted in Region IX stated that there is no one currently familiar with CWA §316(b) activities in the Regional office. He believes there have been one or two Pacific Gas & Electric Company plants that have conducted CWA §316(b) demonstrations in the past; however, the details regarding these demonstrations are not available.

Each of the determinations were unique situations; no precedent for CWA §316(b) determinations has been set in the Region. No facilities other than steam electric have been required to conduct CWA §316(b) demonstrations.

Based on information from sources other than the Regional representative, it is known that in recent months, three facilities have been required to submit demonstration studies. These facilities include:

- San Onofre Nuclear Generating Station (Southern California Edison)
- South Bay Plant (San Diego Gas & Electric)
- Encina Power Plant (San Diego Gas & Electric).

These demonstrations were recently reviewed by EPA Region IX and are presently under review by the State of California.

The major technology used in Region IX for cooling water intakes has been deep ocean intakes installed with velocity caps.

There are no existing inventories in the Region documenting the status of CWA §316(b) activities, nor is there any information available to generate an inventory. Information does not exist on the technologies used in the Region to minimize adverse environmental impacts or on the efficiencies, operational characteristics or frequency of use of technologies.

Region X

Representatives familiar with the CWA §316(b) activities in Region X have not been identified to date. The contact listed in the appendix, who has been kind enough to aid in identification of a representative,

however, had not been successful when the last follow-up call was made.

5.4 Information on NPDES State Requirements Related to Cooling Water Intake Structure

Although all NPDES States are required to implement and enforce regulatory requirements as part of their State programs that are at least as stringent as those imposed by EPA, the lack of formally promulgated regulations addressing CWA §316(b) requirements has led to uneven treatment of this issue at the State level. To obtain information on NPDES State cooling water intake structure regulatory requirements, SAIC reviewed the water pollution control statutes and regulations of the 40 NPDES States. The review focused on regulatory requirements of the States' NPDES permitting programs and on regulations governing water quality standards. The review attempted to identify State statutory or regulatory provisions that specifically addressed technology requirements for cooling water intake structures located at facilities with point source discharges. Appendix F summarizes the results of the NPDES State statutory and regulatory review.

While the review indicated that all NPDES States have addressed thermal discharges and many have statutory or regulatory provisions similar to CWA §316(a) that outline procedures for variances from thermal discharge limits upon a demonstration of no adverse impact, few NPDES States have specifically addressed cooling water intake structure technology specifically by statute or regulation. A number of NPDES States' water quality standards also addressed withdrawals from surface water bodies in ways that could be applied to cooling water intake structures.

Summarized below are several of the State provisions identified related to requirements for cooling water intake structures and cooling water withdrawals. The requirements most closely conforming to CWA §316(b) are described first, followed by other examples of how NPDES States have partially addressed this issue. Summaries of State provisions addressing thermal discharge variances have not been included. Also, additional information on State regulatory requirements is included in Section 5.4.5.

5.4.1 State Provisions Specifically Addressing Cooling Water Intake Structure Technology

Research indicated that three NPDES States have specifically addressed cooling water intake structure by statute or regulation. The regulatory requirements of these NPDES States are summarized below.

- California's Water Quality Control Act includes several provisions that address issues related to the protection of the marine environment related to thermal discharges and cooling water intake structures. One provision requires that each new or expanded coastal power plant or other industrial installation using seawater for cooling, heating or industrial processing must use the best available site, design, technology and mitigation measures feasible to minimize the intake and mortality of all forms of marine life. Another provision requires advance preparation of independent baseline studies of the existing marine system in the area that could be affected by new or expanded industrial facilities using seawater for these purposes. Because these provisions were not located in

State regulations, it is likely that they are implemented through the Regional Water Control Plans developed by the California Regional Water Quality Control Boards.

It appears that California regulates inland intake structures pursuant to a policy statement issued in 1975 and a number of CWA §316(b) determinations made prior to 1980. The policy statement provides that the least preferable source of cooling water consists of non-waste inland waters and that approval of fresh inland waters for cooling use will occur only upon a "demonstrat[ion] that the use of other water supply sources or other methods of cooling would be environmentally undesirable or economically unsound." The policy requires the preparation of an environmental impact statement for new cooling water use or changes in use and requires permits to include provisions for future monitoring and studies. Although the California policy appears to be a tool that would be effective in CWA §316(b) regulation, it is oriented primarily to water consumption. Impingement and entrainment issues are not addressed.[24]

- Illinois NPDES regulations require that "[n]ew water intake structures on waters designated for general use, whose construction begins after the effective date of this Chapter, shall be so

---

24 See Rábago, *supra* note 8, at 476. The California policy itself was not reviewed; information provided was adapted from the Rábago article.

designed as to minimize harm to fish and to other aquatic organisms."

- Indiana's water quality standards addressing temperature limits include requirements for cooling water intake structures. Pursuant to these regulations, intake structures must be designed and located to minimize entrainment and damage to desirable organisms. The standards state that while requirements may vary depending on local conditions, in general, intake structures must have minimum water velocity and may not be located in spawning or nursery areas of important fisheries. Water velocities at screens and other exclusion devices also must be minimized. In addition, Indiana's regulations provide opportunity for the regulated community to request a decision on whether cooling water intake structures meet BAT under CWA §316(b).
- Maryland is the NPDES State that appears to have the most comprehensive requirements related to cooling water intake structures. The regulations first mirror the language in CWA §316(b), requiring that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. BTA is based on consideration of both impingement loss and entrainment loss, and dischargers must make modifications to their facilities to mitigate both. First, dischargers are required to install and operate modifications to limit impingement, provided that costs associated with State required modifications

over a five year period may not exceed five times the estimated annual value of impingement loss as determined by procedures in the regulations. Second, regarding entrainment losses, the discharger is required to determine the extent of entrainment loss on a "spawning or nursing area of consequence" as defined in other State regulations. The regulations provide that if entrainment loss results in "significant environmental impact," the discharger must install and operate functional modifications to mitigate entrainment loss. All requirements are waived for facilities withdrawing less than 10 million gallons per day if the volume withdrawn is less than 20 percent of the design stream flow for nontidal waters or the annual average net flow past the discharge point that is available for dilution for tidal waters.

5.4.2 State Provisions Referring to CWA §316(b) or Federal Regulations

Several NPDES States have included language in State statutes or regulations that reference either CWA §316 or 40 *CFR* Part 125, Subpart I, the section of the NPDES regulations that is reserved for criteria applicable to cooling water intake structures to be developed under CWA §316(b). Examples are provided below.

- Arkansas' water quality standards antidegradation policy requires consistency with CWA §316 in cases where potential water quality impairment is associated with thermal discharges.

- Iowa water pollution control regulations incorporate Federal effluent and pretreatment standards by reference. Standards for cooling water intake structures are reserved.
- New Jersey NPDES regulations state that "the criteria applicable to cooling water intake structure shall be as set forth in 40 *CFR* Part 125, Subpart I."
- New York NPDES regulations require that "[t]he location, design, construction and capacity of cooling water intake structures, in connection with point source thermal discharges, shall reflect the best technology available for minimizing adverse environmental impact."

5.4.3 State Provisions Governing Withdrawals From Surface Water

Several NPDES States were found to have statutory or regulatory provisions imposing requirements on water withdrawals. All provisions described below were found in the temperature section of the State water quality criteria.

- Colorado's discharge permit regulations are applicable to activities including the diversion, carriage, or exchange of water from or into streams and other water bodies, but the context is related to water use rights.
- Georgia's water quality control regulations and standards require permits for surface water withdrawals greater than 100,000 gallons per day. The requirement emphasizes water quantity and conservation rather than ecosystem impacts.

- Minnesota's water quality standards address withdrawal of water from certain types of surface water bodies as part of the temperature criteria for discharges. Provisions addressing temperature include a condition prohibiting withdrawal from and discharge to the hypolimnion in lakes or reservoirs, unless it can be shown that the discharge or withdrawal will be beneficial to water quality.
- Nebraska's temperature criteria include a provision for impoundments stating that unless a special study shows that the discharge of heated effluent into the hypolimnion will be desirable, such practice is not recommended, and water for cooling should not be pumped from the hypolimnion to be discharged to the same body of water.

5.4.4 State Provisions Governing Alteration of Habitat or Resource Impacts

Many State statutes and regulations address alteration of habitat due specifically to discharges of pollutants. Several State rules are not limited to alterations caused by discharges of pollutants and some broaden the cause of alteration to any anthropogenic activity.

- Arkansas water quality standards prohibit physical alterations of habitat in water bodies of certain use designations. Use designations are defined by fish communities supported.
- Connecticut water pollution regulations require coordination with other Federal and State agencies with jurisdiction over fish, wildlife or public health. These organizations may

recommend the imposition of conditions in permits necessary to avoid substantial impairment of fish, shellfish, or wildlife resources.

- The Iowa water quality standards antidegradation policy states that any proposed activity modifying the existing physical, biological, chemical integrity of a water of the State shall not adversely impact these attributes, either on an individual or cumulative basis. An adverse impact includes loss or irreparable damage to aquatic, semiaquatic, or wildlife habitat or populations.

5.4.5 Information on NPDES State Activities Regarding CWA §316(b)

Several NPDES States were contacted by phone to identify representatives familiar with the State's CWA §316(b) program and to attempt to collect the same information as from the EPA Regional contacts. Because of budgetary restraints and the Office of Management and Budget's regulations concerning surveys, only a small sampling of NPDES States were contacted for this assessment. Calls were made to Illinois, Pennsylvania, Wisconsin and Maryland. Only representatives in Pennsylvania and Wisconsin could be identified. The following discussion summarizes the information concerning CWA §316(b) activities collected through direct discussions with representatives from these two States.

Pennsylvania

The State of Pennsylvania has been implementing CWA §316(b) requirements since the mid 1970s. All facilities that take in water at a rate of greater than

one-half foot per second have been required to conduct demonstrations. The facilities for which determinations have been made include all steam electric facilities and several paper mills, refineries and steel mills. For the majority of the facilities, existing intake technologies have been determined to be equivalent to best technology available. Those with unfavorable determinations have been required to install wedge-wire screens, which are considered to be best technology available.

The most recent CWA §316(b) determination made includes the Eddy Stone Facility (within the last five years). A BP Oil Company facility is presently under study. The majority of the facilities in the State had determinations made in the 1970s and 1980s. The CWA §316(b) requirements are not implemented in conjunction with Pennsylvania's NPDES permitting program, but rather are part of a separate program.

It is unclear under which statutory or regulatory provisions the State implements these requirements. A review of the regulatory provisions cited by the State contact indicates that such provisions address thermal discharge limitations and do not specifically address cooling water intake requirements.

Wisconsin

The State representative indicated that little activity regarding CWA §316(b) requirements since the 1970s. Steam electric plants built at that time were often built with generous capacity to allow for growth. Thus, no new plants have been built since that time, and there has been no need for new determinations. Region V would like the State to revisit CWA §316(b) best technology available determinations at permit

reissuance; however, the State is reluctant to comply with this request because of the potential politics involved (i.e., the fishing industry is powerful in the Great Lakes area).

Most of the determinations have been made for steam electric plants. In general, if the cooling water intake flow is high, other industrial facilities may be required to conduct a CWA §316(b) demonstration. The State representative did not know what other industries may have been considered in the past.

Recent CWA §316(b)-related activities within the State have included studies performed four years ago to evaluate impingement of alewife in cooling water intake structures located on Lake Michigan. The State had originally considered a ban on commercial fishing of alewife in the lake because of dwindling populations. The fisherman, however, refuted the ban saying that the majority of the fish were being taken into the many cooling water intakes. The study was therefore initiated to isolate the cause of the problem.

The State representative was not familiar with what types of technologies have been considered best technology available in the past. Most recently, the State has determined that acoustics or sound barriers are BTA based on the results of the studies in Lake Michigan. No inventory on CWA §316(b) activities has been maintained in the State.

An additional call to State officials was made to identify statutory or regulatory provisions under which the State imposed cooling water intake structure requirements. SAIC review of the State NPDES statute and regulations identified no provision that specifically addresses this issue. State officials indicated that withdrawals from surface waters are

regulated under separate statutory provisions, which are primarily directed at limitations on withdrawals and impose certain reporting requirements. These provisions were not available for review.

5.5 Available EEI Power Statistics Database CWA §316(b) Status Information

As part of the overall effort to characterize the current state of affairs with respect to CWA §316(b) activities, efforts were made to gather information on facility status. As discussed in Paper 2, the Edison Electric Institute's (EEI's) Power Statistics Database (EEI, 1988-1991) contains information for every conventional, utility-owned steam electric plant in the United States. The subfile within the database entitled, UDESIGN2, contains fields that are related to the status of CWA §316(b) activities. This status information can be related to individual generating units at each of the reporting plants.

The version of the EEI Power Statistics Database available for this study is dated 1988-1991; therefore, data contained in the database are several years old. The information, however, was considered valid for the purposes of this study since CWA §316(b) activities are not occurring at a fast rate.

The information in the database was compiled by linking the CWA §316(b) status information with each of the steam electric generating units in each of the States and territories. Status information is not presented in the database for units located in the States of Colorado, Idaho, South Dakota, and Oregon. The reason for the exclusion of data for units in these States was not investigated. Quality control checks of the data gathering tools and verification procedures

used in the development of the database are needed to evaluate this issue.

The main limitation in using the database to determine CWA §316(b) status is that the status fields under which the units are presently categorized are not well defined and, in some cases, seem ambiguous. Additional information on how the information was obtained and categorized, including the survey questions that were posed to plant operators, would allow for better interpretation of the information provided. The CWA §316(b) status information in the EEI Power Statistics Database may provide a basis for a future inventory; however, the existing information should first be validated.

The database includes generating units currently in commercial operation, units under construction, planned units (still under design), units on standby or in economic reserve, deactivated units, sold units and units retired over the last five to eight years (EEI 1993). Within the database, 10 codes are used to reflect the status of CWA §316(b) activities for each generating unit. A listing and definition of each of the 10 codes is presented below (EEI, 1993):

- AP Existing intake structure approved.
- NR No monitoring required. In essence, existing structure acceptable or plant used very infrequently.
- RV 316(b) demonstration report has been submitted to permit agency and is under review at State or Regional level.
- ND No determination on applicability.
- PR Monitoring program is in progress at company level. Nothing submitted to agency.

- DR Demonstration rejected.
- AM Existing intake approved with modifications; further monitoring required.
- CA Existing structure conditionally approved; further monitoring is required.
- AN Existing intake approved with modifications; no further monitoring is required.
- HA Administrative adjudicatory hearing scheduled or in progress.

Table 5.1 summarizes CWA §316(b) status as provided in the EEI Power Statistics Database (EEI 1991). The status is given for the units within each State (excluding the four States that are missing from the database as discussed in Section 5.2.1 of this paper).

Table 5.1 Distribution of Operational Units by State and CWA §316(b) Status

State	CWA §316(b) Status										
	AP	NR	RV	ND	PR	DR	AM	CA	AN	HA	Total # Generating Units Classified for State
AK				1							1
AL	41	2	1		2						46
AR	4										4
AZ		2							-		2
CA	67		13		2						82
CT	18										18
CO											0
DC		2									2
DE	9				3						12
FL	52	5		11							68
GA	10	34					7		1		52

Table 5.1 Distribution of Operational Units by State and CWA §316(b) Status (continued)

State	CWA §316(b) Status										
	AP	NR	RV	ND	PR	DR	AM	CA	AN	HA	Total # Generating Units Classified for State
GU					4						4
HI	14	4	4								22
IA	32	2		1				5			40
ID											0
IL	54	15	14		15						98
IN	56	4	6	2	2						70
KS	3	18		1							22
KY	46	3		1							50
LA	6	1		15							22
MA	34				2						36
MD	12	6	8		1						27
ME	10										10

Table 5.1 Distribution of Operational Units by State and CWA §316(b) Status (continued)

State	CWA §316(b) Status										
	AP	NR	RV	ND	PR	DR	AM	CA	AN	HA	Total # Generating Units Classified for State
MI	56	3	14			10					83
MN	35	4	3								42
MC	23										23
MS	14										14
MT				1							1
NC	17	27									44
ND		4		4							8
NE	10										10
NH	5										5
NJ	7	1	25		6						39
NM				4							4
NV		4			3						7

Table 5.1 Distribution of Operational Units by State and CWA §316(b) Status (continued)

State	CWA §316(b) Status										
	AP	NR	RV	ND	PR	DR	AM	CA	AN	HA	Total # Generating Units Classified for State
NY	64	14	4	1							83
OH	55	7	15	25							102
OK	6	4		8							18
OR											0
PA	51	10		1	3						65
PR	4	6	2								12
RI	3										3
SC	35	2									37
SD											0
TN	35		4								39
TX	26	16		19	2						63
UT		1									1

Table 5.1 Distribution of Operational Units by State and CWA §316(b) Status (continued)

State	CWA §316(b) Status										
	AP	NR	RV	ND	PR	DR	AM	CA	AN	HA	Total # Generating Units Classified for State
VA	23		5	2							30
VI	1										1
VT	1										1
WA				5							5
WI	60		4								64
WV	16	13	2								31
WY							3				3
Totals	1015	214	124	102	45	10	10	5	1	0	1526
Percent	67	14	8	7	3	<1	<1	<1	<1	0	100

It should be noted that the figures contained in Table 5.1 are for individual steam electric generating units as opposed to facilities as a whole. Each facility may have one or more generating units. In addition, it should be noted that the total number of units which have been documented in the database is 2,417. The total number of units which have been classified as to their CWA §316(b) status is only 1,526. Thus, only 63 percent of the existing units are represented in this analysis. Further analysis of background documents supporting the database necessary to determine the status or reasons for the missing 37 percent of the generating units.

In general, the CWA §316(b) data in the EEI Power Statistics Database indicate that the majority of the generating units documented (approximately 80 percent) have had existing intake structures approved under CWA §316(b). Included in this majority are those units with the status codes AP and NR. These two codes appear to be similar in that the existing structure is to have been approved, but it is not clear whether monitoring was originally required in the AP category, or whether it was subsequently required.

The database also shows that the number of operational generating units which are currently under review by the permit agency (code RV) is nine percent of the total operational generating units documented. It is not known whether these units were required to submit demonstrations recently or whether they may have submitted the demonstrations long ago and the permitting agency has just not made a determination. In addition, six percent of the units are coded ND meaning no determination on CWA §316(b) applicability has been made. It is not clear whether

these facilities have been considered or whether the facilities have only submitted information and a determination is pending.

In the database, three percent of the operational generating units are coded PR. This status code is for generating units that are currently performing monitoring for CWA §316(b) demonstrations but have not yet submitted the studies to the regulatory agency. Approximately one percent of the total units are coded under the remaining categories which include: (1) those where the demonstrations have been rejected; (2) those where the existing intake has been approved with modifications and monitoring has or has not been required; and (3) those where the existing intake structure has been conditionally approved and further monitoring has been required. No States have determinations coded as being under the administrative adjudicatory hearing, scheduled or in progress status.

Of interest in Table 5-1 is that there are four States where all of the units listed for the state are coded ND, meaning determinations on CWA §316(b) applicability have not been made. These States include Alaska, Montana, New Mexico and Washington. No conclusions can be made at this time as to why determinations on applicability have not been made for the units in these States.

Because of the ambiguity inherent in the CWA §316(b) status codes provided in the EEI Power Statistics Database, it is not possible to draw strong conclusions about the information at this time. It is recommended that additional data, to both verify and better define the information, be collected in subsequent studies. Verification may be performed by

organizing the status information on a facility-specific basis within each State that can then be subsequently verified with State representatives. Improved definitions of the status could be obtained through review of the survey tools and procedures used.

* * *

Table 11-1: Partial List of CWIS, Ecosystem, and Species Characteristics Influencing Potential for I&E

CWIS Characteristics*	Ecosystem and Species Characteristics
Location ➢ Depth of intake ➢ Distance from shoreline ➢ Proximity of intake withdrawal and discharge ➢ Proximity to other industrial discharges or water withdrawals ➢ Proximity to an area of biological concern	**Ecosystem Characteristics (abiotic environment)** ➢ Source waterbody type ➢ Water temperatures ➢ Ambient light conditions ➢ Salinity levels ➢ Dissolved oxygen levels ➢ Tides/currents ➢ Direction and rate of ambient flows
Design ➢ Type of intake structure (size, shape, configuration, orientation) ➢ Design intake velocity ➢ Presence/absence of intake control and fish protection technologies	**Species Characteristics (physiology, behavior, life history)** ➢ Density in zone of influence of CWIS ➢ Spatial and temporal distributions (e.g., daily, seasonal, annual migrations)

- Intake Screen Systems
- Passive Intake Systems
- Fish Diversion/Avoidance Systems
- Water temperature in cooling system
- Temperature change during entrainment
- Duration of entrainment
- Use of intake biocides and ice removal technologies
- Scheduling of timing, duration, frequency, and quantity of water withdrawal.

Construction

- Mortality of aquatic organisms
- Displacement of aquatic organizims
- Destruction of habitat (e.g., burial of eggs deposited in stream beds, increased turbidity of water column)
- Habitat preferences (e.g., depth, substrate)
- Ability to detect and avoid intake currents
- Swimming speeds
- Mobility
- Body size
- Age/developmental stage
- Physiological tolerances (e.g., temperature, salinity, dissolved oxygen)
- Feeding habits
- Reproductive strategy
- Mode of egg and larval dispersal
- Generation time

Capacity ➢ Type of withdrawal — once through vs. recycled (cooling water volume and volume per unit time) ➢ Ratio of cooling water intake flow to source water flow

'All of these CWIS characteristics can potentially be controlled to minimize adverse environmental impacts (I&E) of new facilities.

[Graphic omitted]

State of New Jersey
Department of Environmental Protection
Environmental Regulation
P.O. Box 423, Trenton, NJ 08625-423
FAX: (609) 777-1330

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

November 9, 2000

Cooling Water Intake Structures (New Facilities)
Proposed Rule Comment Clerk—W-00-03
Water Docket, Room EB 57
401 M Street, SW
Washington, DC 20460

Dear Sir or Madam:

The New Jersey Department of Environmental Protection (hereafter "the Department") appreciates the opportunity to provide comments to the United States Environmental Protection Agency (hereafter "EPA" or "the Agency") on the above referenced rule proposal. The Department has included comments on the language proposed in the preamble. In an effort to promote clarity, the Department has referenced either the section name and page number and/or reiterated a portion of the preamble language. The Department's comments are as follows:

Section V. Scope and Applicability of the Proposed Rule, Sections A-E

Comment 1 - Clear Applicability (pages 49066 - 49069)

The Department supports the language and definitions (i.e. "New Facility", "Cooling Water Intake Structure") described in items A-E of this section as well as in proposed Sec. 125.81. It is imperative that the applicability of Section 316(b) be unambiguous and straightforward to ensure that State agencies can utilize their resources focusing as to how to minimize impingement and entrainment as opposed to debating as to when Section 316(b) applies. The Department does not support continuation of the approach adopted in the 1977 draft guidance which was based on the judgement that "[t]he decision as to best technology available for intake design location, construction and capacity must be made on a case-by-case basis."

In Section A entitled "Who is Covered Under This Proposed Rule", the following criteria is stated:

- Your facility is a new facility;
- Your new facility's has a cooling water intake structure or structures;
- Your new facility's cooling water intake structure(s) withdraw(s) water from waters of the U.S. and at least twenty-five percent of the water withdrawn is used for contact or noncontact cooling purposes;

- Your new facility has a design intake flow of greater than two (2) million gallons per day (MGD); and
- Your new facility has an NPDES permit or is required to obtain one.

The Department supports these specific criteria and finds them reasonable in ensuring that new facilities that are likely to have an impact will be addressed.

Comment 2 - Consideration of Reuse/Recycling

The Department notes that on page 49067 the following is stated:

> The Agency also invites comment on an alternative where the Agency would define a cooling water intake structure to include intake structures if a facility uses five percent or more of the water drawn through the structure for cooling purposes. This alternative would further ensure that almost all cooling water withdrawn from waters of the U.S. is addressed by the requirements of this national regulation. This alternative almost might minimize any potential that the proposed 25 percent threshold would discourage recycling of cooling water, or reuse of cooling water for process needs, by facilities that recycle or reuse cooling water at rates above 25 percent, and might choose to reduced their recycling/reuse rates to avoid meeting the requirements of the proposed rule. For similar reasons, the

> Agency is considering alternative definitions for a cooling water intake structure based on whether 20 percent, 15 percent, or 10 percent of the intake flow drawn through the structure used for cooling.

The Department supports reuse and recycling of cooling water; however, is concerned that proposing an alternate percentage based on these concerns will complicate the initial issue. As a result, the Department suggests that the definitive threshold of 25% be maintained in final rule and that reuse/recycling alternatives (along with any alternative withdrawal percentages) be treated on a site-specific basis where language be included in final rule stating such.

Comment 3 - Consideration of Alternative Flow Thresholds

On page 49067 the following is stated, "In addition to a two MGD flow threshold, the Agency is considering higher flow thresholds including 5, 10, 15, 20, 25 and 30 MGD."

As stated in the previous comment, the Department feels 2 MGD is a reasonable value.

Comment 4 - Flow Threshold for Smaller Waterbodies

On page 49068 the following is stated:

> In addition to the MGD flow threshold discussed above, EPA is considering whether it should add a flow threshold to address the

> potential for adverse environmental impact posed by facilities that withdraw less than 2 million gallons of water per day but are located on small water bodies. To provide an additional measure of protection for these water bodies, the Agency might also include facilities that withdraw less than 2 MGD in this rulemaking if they withdraw more than 1% of the mean annual flow of a freshwater river or stream; the mean annual volume of a lake or reservoir; or the volume of the water column within the area centered about the opening of the intake with a diameter defined by the distance of one tidal excursion at the mean low water level for an estuary or tidal river.

The Department supports this addition and feels that it will aid in applying section 316(b).

Comment 5 - Supply of Intake Water to Other Users

On page 49069, the following is stated regarding a situation where one facility might take in cooling water and then transfer it to other new facilities prior to discharge to waters of the United States:

> In addition, as in the previous paragraph, the Agency invites comment on a scenario in which the Director would place cooling water intake requirements in the new facility's NPDES permit and in the NPDES permit of the entity that controls the intake to ensure compliance with the cooling water

> intake requirements proposed today .....Alternatively, the Director could place cooling water intake requirements only in the permit of the facility that operates the structure. This would be administratively simpler and would limit permit requirements to the facility with direct operational control of the structure. The Agency also requests comment on this approach.

In New Jersey, the Department currently regulates existing facilities where the facility with the intake structure supplies water to an adjacent facility (where the adjacent facility does not have an intake structure). In this circumstance, the Department regulates the facility who owns and operates the intake structure and does not pose Section 316(b) requirements in the facility that uses the water that comes through that intake structure. It would be difficult to regulate a facility with section 316(b) conditions if they do not own and operate the intake structure. As such, the Department recommends that EPA propose that Section 316(b) requirements be only included for the facility that owns and operates the intake structure.

Section VII., item D - What Constitutes Adverse Environmental Impact Under the Proposed Rule?

Comment 6 - Definition of Adverse Environmental Impact

On page 49074 the following is stated regarding the definition of adverse environmental impact:

> The regulatory language in today's proposed rule does not include a definition of adverse environmental impact. However, the Agency is considering promulgating each of the alternatives discussed below as part of the final regulation and, thus, each should be viewed in a regulatory context. The Agency also might ultimately decide to publish one of these alternatives in guidance that supports the final rule. EPA is also considering taking no action regarding the definition of adverse environmental impact.

The Department notes that EPA then describes four alternative definitions for adverse impact where the third alternative is described as follows:

> Under a third alternative EPA is considering, adverse environmental impact would be deemed to occur whenever aquatic organisms are impinged or entrained as a result of the operation of a cooling water intake. Under this alternative, "adverse environmental impact" could be defined as "any impingement or entrainment of aquatic organisms".

The Department strongly recommends that EPA define adverse environmental impact in its final rule. Specifically, the Department feels that this third alternative is the only practical alternative and should be adopted in final rule for Section 316(b) for new facilities. This is the same definition that the Department currently uses in applying Section 316(b) policies for existing facilities. The

Department considers the death of any fish at or through a cooling water intake to be an "adverse impact" which must be minimized under Section 316(b). This position makes sense and simplifies an already complex analysis. State Agencies and permitting authorities could engage in a debate for years as to the population measure of a given fish species, let alone many fish species. The results of biological population studies and modeling can be very subjective because it is difficult to identify, measure, and attribute the impact of each of the many variables (what's happening on a coast wide basis, or what's happening with the climate) affecting populations of each of the impacted species. Rather than engage in this kind of biological debate, time and resources would be better spent focusing on the magnitude of the impingement and entrainment losses in relation to the costs and benefits of implementing various technologies to avoid or minimize the impact. This focus is appropriate for section 316(b) which the Departments feels is a technology-driven provision.

On a similar note, on page 49075 the following is stated:

> However, EPA also request comment on adapting the section 316(a) standard for purposes of section 316(b) and defining adverse environmental impact as impacts likely to interfere with the protection and propagation of a balanced indigenous population of fish, shellfish, and wildlife."

The Department is very much opposed to EPA adapting the section 316(a) standard for the purposes of section 316(b). As described above, the Department strongly recommends that adverse environmental impact be defined as "any impingement or entrainment of aquatic organisms" or on an individual level as opposed to a population level.

Section VIII, item A. - What is the Best Technology Available for Minimizing Adverse Environmental Impact at New Facilities?

Comment 7- Specific Language Regarding Location, Design and Capacity

On page 49076 the following is stated:

> Under the proposed rule, EPA would group water bodies into four categories: (1) freshwater rivers or screams, (2) lakes or reservoirs, (3) tidal rivers or estuaries; and (4) oceans. The agency considers location to be the most important factor in addressing adverse environmental impact caused by cooling water intake structures.

On page 49078 this implementation strategy is continued by stating:

> The design and capacity of the intake structure are important factors that affect the velocity or speed at which the water passes through the screen or other barrier at the entrance to the cooling water intake structure. Under today's proposed rule,

> minimum flow and velocity requirements would be applied based on the actual placement of the cooling water intake structure within the particular water body types. Because different water body types have different potential for adverse environmental impact, the requirements proposed to minimize adverse environmental impact would vary by water body type.

The Department agrees that location is the most important factor in minimizing impingement and entrainment issues and supports this location framework. The Department also supports the adoption of specific flow and intake velocity requirements based on the water body types as proposed in Sec. 125.84. Definitive requirements are essential in enabling permitting authorities to guide new facilities as to what intake technologies should be used at their facilities to minimize impingement and entrainment impacts.

Specific guidelines, as included in the proposed rule, would be a great improvement over the historical case-by-case approach. The Department does not recommend continuation of implementing section 316(b) on a case-by-case, site specific basis as suggested on page 49082.

Comment 8 - Dry-Cooling as a Technology

On page 49081, the following is stated regarding dry-cooling:

> For example, for the types and sizes of facilities in areas where dry cooling has been employed at facilities in operation, permitted, or slated for construction, the Agency might determine that dry cooling is the best technology available to minimize adverse environmental impact. EPA also invites comment on regulatory approaches of this type based on hybrid wet-dry cooling rather than dry cooling.

Clearly any technology, such as dry-cooling, that requires a zero-intake flow (or nearly zero, extremely low-flow) requirement is the best technology to minimize impingement and entrainment. Given this fact, the Department suggests that the Agency definitively state that dry-cooling is considered to be the best technology where feasible. Even if dry-cooling is not feasible at all locations, a statement that dry-cooling is best technology may encourage facilities to design new facilities with dry-cooling systems. The Agency should also be clear as to what environmental studies, if any, would be required if a dry-cooling system is installed. If studies are not required under a dry-cooling system, this should be clearly stated as it may be an incentive for new facilities to adopt this technology. Advocacy of this technology over other technologies may aid in advancing the technology and, eventual installment of such, would surely minimize impingement/entrainment impacts.

Comment 9 - Tiered Approach to Adverse Environmental Impact

On page 49082 the following is stated:

> Some stakeholders have suggested an alternative regulatory framework in which section 316(b) implementation is accomplished through site-specific examination of the risk of adverse environmental impact and (assuming the cooling water intake poses some reasonable risk of adverse environmental impact) site-specific evaluation of potential BTA technologies. Under one approach, the framework of the site-specific alternative would consist of three tiers. In Tiers 1 and 2, the facility, in consultation with the Director, would assess the potential for risk of adverse environmental impact associated with the proposed cooling water intake structure. Tier 1 would be both a screening and an assessment tier that relies on existing information that is site-specific or relevant to the adverse environmental impact determination. Tier 2 would focus on collection and analysis of additional information collection activities, as necessary, to make the adverse environmental impact determination. In Tier 3, which would assume that the Director has found that the cooling water intake structure is reasonably likely to pose risk of adverse environmental impact, the facility would assess BTA

alternatives, including an evaluation of costs and benefits.

As discussed in a previous comment, the Department strongly recommends that the agency define adverse environmental impact in final rule as occurring whenever there are any impingement and/or entrainment effects. Given the above discussion, this position greatly simplifies this very complex three tiered analysis. In adopting such a position and considering the above discussion, the permitting agency could skip right to Tier 3 and focus its efforts on available technologies rather than debating about the very subjective determination of adverse environmental impact. This suggested technology-based approach would allow the permitting authority to consider the most protective technology to minimize impacts and compare the cost of the option to the environmental benefits which will be gained by its implementation. If the cost of the most protective option is not wholly disproportionate to the expected environmental benefits, then that option is required under the permit as BTA. But if the cost of minimization is considerable (wholly disproportionate) to the expected benefits, it is rejected and the same analysis is then applied to the next protective option. This process would continue until there is an option that can be required at a cost that is reasonable compared to the level of minimization to be expected. Agencies could spend years in circuitous debate on Tiers 1 and 2.

VIII.3.d. Flow Requirements for New Facilities With Cooling Water Intake Structures Located in Estuaries and Tidal Rivers or the Littoral Zone in Other Water Body Types

Comment 10 - Wet-Cooling, Closed-Cycle Recirculating System

On page 49087, the following is stated:

> Today's proposal would require that the intake flow withdrawn by a cooling water intake structure be reduced to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system by all cooling water intake structures at the facility.....In addition, EPA cost estimates show that this requirement is available to new facilities on a national level.

Given that closed-cycle cooling is an available technology, the Department suggests that the Agency mandate this specific technology by calling it "best technology available" for facilities that will be located in estuaries and tidal rivers of the Littoral Zone. Additional technologies may need to be applied at the intake to ensure that impingement and entrainment is minimized to the best extent practicable. The Agency should also be clear as to what environmental studies, would be required if a closed-cycle cooling system is installed. If studies are either not required or a lesser amount is required for a wet closed-cycle cooling system, this should be clearly stated. A lesser amount or lesser

amount of complexity for scientific studies may be an incentive for new facilities to adopt this technology. If wet closed-cycle cooling systems are considered infeasible or the costs are wholly disproportionate to the benefits based on site-specific considerations, the facility would bear the burden of proof for alternate intake protection technologies.

VIII.A.6. What is the Role of Restoration Measures?

Comment 11 - Restoration Measures

On page 49089 the following is stated:

> Given the limits on the ability of direct control technologies (location, flow, velocity, and other requirements) to eliminate environmental harm in all circumstances, EPA is considering a variety of mandatory, discretionary and voluntary regulatory approaches involving restoration measures. On the other hand, EPA also is considering specifying that restoration measures may not be part of a Section 316(b) determination. EPA invites comment on the appropriate role of restoration, i[f] any, under section 316(b).

First and foremost, the Department considers Section 316(b) to be a technology driven provision. Any technology for which the costs are not wholly disproportionate to the benefits must be required for new cooling water intake structures. As described previously, the Department recommends that final 316(b) rule include language to state that

dry-cooling closed-cycle recirculating systems are the first choice to minimize impingement/ entrainment impacts thereby being the best technology. As a second choice, the Department recommends that language be included in the final rule stating that wet cooling closed-cycle recirculating systems are the best technology available since they are an available technology that is effective in minimizing intake water flows and hence impingement/entrainment impacts. The cooling water intake structures for facilities with wet-cooling closed-cycle recirculating systems must still be equipped with technology to minimize impingement/entrainment to the best extent practicable.

In the event that dry-cooling closed-cycle recirculating systems are not feasible and wet-cooling closed-cycle cooling recirculating systems are installed, the Department supports mitigation measures to further mitigate impingement/ entrainment losses. There is no debate that wetlands aid in producing fish and therefore help mitigate the effects of a facility's impingement and entrainment numbers. This is especially important since shrinking open space and lost wetlands have become a critical environmental issue. The Department supports the inclusion of restoration measures as part of section 316(b) rules. However, this support is conditional on the premise that all technological options are carefully considered first and mitigation shall not be required as a substitute for technology.

Given the previous recommendation by the Department that cooling towers should be recognized as best technology available, the Department suggests that language be included in final rule to state that mitigation measures are mandatory if it is determined that cooling towers can not be installed for whatever site-specific reasons. The Department also suggests that language be included in the final rule to state that mitigation measures are always encouraged and recognized as reducing impingement/entrainment impacts on a waterbody for the purposes of section 316(b). If a permitting agency determines that mitigation measures will be part of the section 316(b) determination, these measures must be specifically required in that facility's NPDES permit.

VIII.A.7. Additional and Alternative BTA Requirements

Comment 12 - Timing Issues for Alternate BTA Requirements

On page 49091 the following is stated:

> Proposed Sec. 125.85 would allow the Director, in the permit development process, to set alternative BTA requirements that are less stringent than the nationally applicable requirements..... Proposed Sec. 125.85(a)(2) provides that alternative requirements that are less stringent than the requirements of Sec. 125.84 would be approved only if compliance with the

> requirement at issue would result in compliance costs wholly out of proportion to the costs considered during development of the requirement at issue, the request is made in accordance with 40 CFR part 124, the alternative requirement requested is no less stringent than necessary, and the alternative requirement will ensure compliance with sections 208(e) and 301(b)(1)(C) of the Clean Water Act.

The Department appreciates that flexibility is being given to the permitting authorities as discussed in this proposed section. However, it is critical that the timing element be also addressed in this section. If a facility has determined that the conditions in Sec. 125.84 can not be met and the facility seeks approval under this alternate language in Sec. 125.85, it is critical that the facility consult with the permitting agency and submit a demonstration as to why the conditions in Sec. 125.84 can not be met. If this demonstration is accepted by the permitting authority, a pre-determination can be issued and the facility can move on to completing the requirements described in Sec. 125.85. This will enable the permitting authority to render a decision regarding the feasibility of approval under Sec. 125.85 before extensive time and resources are committed by the facility, in designing and completing the requirements in Sec. 125.86, as well as before extensive review time and resources are committed by the permitting authority.

C. How is Cost Being Considered in Establishing BTA for New Facilities?

Comment 13 - Use of Wholly Disproportionate Cost Test

On page 49094 the following is stated:

> Under the wholly disproportionate cost test, a cooling water intake structure technology would not be deemed to reflect BTA if the incremental cost of requiring the use of that technology are wholly disproportionate to the environmental benefits to be gained through its use. Several section 316(b) administrative decisions have stated that this test is the most appropriate for determining economic burden.

The Department currently uses the wholly disproportionate test in applying section 316(b) to its existing facilities and supports the use of this useful test. However, the Department strongly recommends that EPA offer some guidance as to its intent regarding the term "wholly disproportionate" where a specific ratio or range of ratios should be defined. In the Department's experience, industries view "wholly disproportionate" as meaning a ratio of 1:1 costs versus benefits where, if costs do not equal benefits, the technology does not pass the test. Clearly, the Department does not agree that 1:1 is "wholly disproportionate". Additional guidance on this term is essential.

IX. Implementation

Comment 14 - Clear Implementation Requirements

On page 49096 the following is stated:

> Under the proposed rule, section 316(b) requirements would be implemented in an NPDES permit. The regulations would establish application, monitoring, recordkeeping, and reporting requirements for new facilities. The proposed rule would also include requirements for Directors in developing NPDES permits for new facilities. The proposed rule states that the Director, at a minimum, must include in the permit the cooling water intake structure requirements at Sec. 125.84, monitoring conditions at Sec. 125.87, and recordkeeping and reporting requirements at Sec. 125.88.

The Department supports the clear language included in the preamble as well as in the proposed sections. This information will be very helpful in guiding permitting authorities as well as applicants in implementing section 316(b) for new facilities.

Again, the Department appreciates the opportunity to provide comments. Please feel free to contact Chief Debra Hammond of the Bureau of Point Source Permitting at (609) 292-4860 if you should have any questions regarding this letter.

Sincerely,

/s/ Dennis Hart

Dennis Hart
Assistant Commissioner
Environmental Regulation

Comment ID – 316bNFR.206.014

Subject Matter Code	**10.11**
	Request for Comment: Dry Cooling -- Proposed Option

Author Name	David K. Gordon & Reed W. Super
Organization	Riverkeeper, et al.

Dry Cooling Installations Are Economically Affordable, Beneficial And Are Increasingly-Frequent.

As noted, the Clean Water Act affords compliance costs a minor role, if any, in the determination of best technology available for minimizing adverse environmental impact from new sources. More importantly, the incremental costs of installing and operating dry cooling systems are relatively insignificant in the context of the electric generating industry's overall capital costs, revenues and profits. In any event, the incremental costs pale in comparison to the vast benefit to aquatic and marine resources which dry cooling provides. Moreover, dry cooling may provide environmental benefits beyond the huge avoidance of impact to aquatic and marine ecosystems, and may provide other economic benefits to the power industry.

Tellus conducted a comparative economic assessment of the costs of a zero intake rule compared

---

to the other options in order to determine whether dry cooling is cost-effective. EPA estimated that the total annualized cost of a national dry cooling requirement would be $193 million, and electric generators would incur $187.2 million of that total. Applying the Proposed Regulation's "compliance cost/revenue test," the Tellus Report demonstrates that the capital cost and operations and maintenance costs of air-cooled structures at combined-cycle electric generating plants represents a small fraction, only 2-3%, of the estimated annual revenues for those facilities. <FN 82>

Even despite somewhat higher incremental costs for dry cooling, other factors often compensate for or offset such costs, or even provide a net economic benefit for industry as well as the public. As a result, as explained below and more fully in the Tellus Report, dry cooling installations at electric power plants are increasingly common and growing rapidly. First, because newer combined-cycle plants need cooling only for the steam portion of their cycle (only about a third of their total capacity), they can be cooled with a much smaller dry cooling system than a comparably sized, steam-only generating plant. Thus the increased cost for dry cooling is considerably smaller than it would have otherwise been for conventional steam plants. In fact, dry cooling costs at today's combined cycle facilities are roughly equivalent to the costs for installing a wet system at a conventional steam facility. <FN 83>

Moreover, rising populations, urban sprawl, and economic growth in arid parts of the country have put ever greater strains on U.S. aquatic and marine resources. In many areas regulators and the public are

---

[Footer omitted in printing.]

growing increasingly intolerant of irresponsible water use, especially at the prodigious amounts consumed by power plants. Indeed, the emphasis in many states in recent years has been on "zero-discharge" facilities. As a result, dry cooling often streamlines the permitting process for all parties by avoiding controversial and complex assessment of ecosystem damage and mitigation strategies. Such sensitivity to water concerns years ago led European regulators to pioneer the use of dry cooling. <FN 84>

In some climates, dry cooling systems for some facilities may be 1%-2% less efficient in cooling power plant condensers, resulting in corresponding increases in costs (referred to as an "energy penalty"). However, dry cooling facilitates an increase in energy transmission efficiency because the minimal water consumption needs of air-cooled facilities allow them to be located much closer to consumers than wet-cooled facilities which are required to locate on major water bodies. The increased siting flexibility afforded by dry cooling increases efficiency and decreases transmission losses, thus yielding a net efficiency gain throughout the entire generation-to-consumption system. <FN 85> In any event, energy conservation measures can more than offset any potential minor loss of efficiency from dry cooling.<FN 86> Moreover, in cold climates, where ambient air temperatures are often significantly below 40 degrees F, dry cooling systems can actually be more efficient at removing heat than a comparable wet-cooling system. In such cases, less fuel is needed to produce an equivalent amount of energy, thereby reducing both costs and air emissions and affording an "energy bonus." <FN 87>

[Footer omitted in printing.]

Any net efficiency losses that might result from the use of dry cooling must be viewed in the context of overall system-wide efficiency. The potential 1.5% dry cooling energy loss is very small compared with other typical system-wide efficiency losses. A typical steam electric generator is only 30 to 40% energy efficient; two-thirds of the heat from fuel combustion in a typical steam electric generator is simply wasted.<FN 88> The most advanced new combined cycle turbines are capable of efficiencies as high as 60%. New cogeneration plants are often as high as 80 to 90 % energy-efficient because the exhaust heat can be put to use which avoids other fuel combustion elsewhere. Thus, the building of modern generating facilities with dry cooling systems provides significant efficiency gains which dwarfs any potential loss due to the cooling system design.<FN 89>

Applicants are quick to accept dry cooling, despite earlier misgivings, when regulators require it to preserve aquatic ecosystems and other natural resources. For example, PG&E Generating Co., after opposing dry cooling due to cost concerns, readily accepted a dry cooling-equivalent capacity permit condition set by the New York State Department of Environmental Conservation for its proposed plant at Athens, on the Hudson River. Shortly after the DEC ruling the PG&E director of government relations summarized the company's position: "We're not challenging any of the conditions. We're going to accept it. Glad to have it." <FN 90>

The practicability of dry cooling is further reflected in its increasingly common use. Though dry cooling systems still represent just a small fraction of the total

market for power plant cooling, installations of dry cooling technology in the U.S. have been growing rapidly since the early 1980s. Approximately 27 percent of new capacity since 1985 has used dry cooling.

At present there are over 600 electric power plants throughout the world using dry cooling technology, including at least 50 in the U.S. representing nearly 6000 MW of generating capacity.<FN 91> Further, an additional 4600 MW of air-cooled capacity are currently under construction and due online by 2002, not counting additional capacity cooled by hybrid wet/dry cooling systems. Canada and Mexico together have at least 7 air-cooled power plants, representing roughly 1000 MW of online capacity. The world's largest air-cooled power plant is the 4000 MW Matimba Generating Station in South Africa, which-as a nation has over 10,000 MW of electric generating capacity online today using dry cooling systems.

Dry cooling is a demonstrated, available, proven, effective, reliable and affordable cooling technology, the use of which is rapidly increasing in the U.S. and world-wide. Because dry cooling systems are the best technology available for minimizing the adverse environmental impact of cooling water intake structures, they must be required for all new facilities under the Phase I regulation.

Footnotes

82. Tellus Report, at pp. 14-16. Despite assembling some evidence suggesting that the capital cost and operations and maintenance costs of air-cooled

structures are lower than suggested by EPA, Tellus nevertheless used the EPA values in its calculations.

83. Id. at p. 16.

84. Id. at p. 17.

85. Id. at p. 7. Electric transmission line losses lines are generally between S and percent system-wide for most electric grids.

86. Id. at p. 8. Nearly as much fuel is wasted by end-users of electric power as by electric generators. Typical office buildings in the U.S. waste about two-thirds of the energy it consumes each year. Thus, any losses in energy efficiency any associated with dry cooling could easily be recouped through targeted demand side management (i.e., conservation) measures.

87. Id. at p. 7.

88. Id. at p. 8, citing Kaarsberg (1999).

89. Id. at p. 8. Indeed, EPA has issued Clean Air Act regulations for the electric industry that caused similar efficiency penalties in order to reduce the air pollutants NOx and SO2.

90. Albany Times-Union, July 15, 2000.

91. EPA's preamble erroneously states that there are only 60 dry-cooled facilities world-wide. 65 Fed. Reg. at 49081.

EPA Response

EPA disagrees with the factual statements and arguments made by the commenter. Each issue is responded to below.

EPA disagrees that the "CWA affords compliance costs a minor role, if any, in the determination of best technology available for minimizing adverse

---

environmental impact from new sources." EPA does not believe that section 316(b) of the CWA precludes EPA from considering cost. This interpretation is supported by section 316(b)'s cross references to sections 301 and 306 of the CWA which may reasonably be interpreted to mean that Congress intended EPA to control intake when it controlled discharges under the same technology-based standard. It is inconsistent for the commenter to advocate EPA to interpret the references to 301 and 306 to support a technology-based approach to the rule but then to advocate that EPA may not consider the factors listed in sections 304(BAT) or 306 (NSPS) in determining "best technology available for minimizing adverse environmental impact" under CWA section 316(b). Moreover, this interpretation is supported by the similarity of the statutory standards in section 316(b)("best technology available for minimizing adverse environmental impact") to the statutory standards in sections 301, 304, and 306 of the CWA. C.I.R. v. Lundy, 516 U.S. 235 (1996)(It is a normal rule of statutory construction that identical words used in different part of the same act are intended to have the same meaning.) Section 306(b)(1)(B), governing new source performance standards for new sources, specifically states that in establishing "best available demonstrated control technology," the Administrator shall take into consideration "the cost of achieving such effluent reduction." Sections 301 and 304 which require EPA to establish effluent limitations guidelines for existing facilities that reflect "best available technology" or "best available technology economically achievable," "best conventional technology" and "best

---

[Footer omitted in printing.]

practicable technology" all provide that cost may be considered to some degree. For example, in considering "best available technology," the statute provides EPA shall consider "the cost of achieving such effluent reduction." See CWA section 304(b)(2)(B). Several courts (as well as the EPA Administrator in a number of formal adjudications cited below) have stated that cost is an appropriate factor under section 316(b). In Seacoast Anti-Pollution League v. Costle, 597 F.2d 306, 311 (1st Cir. 1979), the Court stated "[t]he legislative history clearly makes cost an acceptable consideration in determining whether the intake design reflect[s] the best technology available." In United States Steel Corp. v. Train, 556 F.2d 822, 850 (7th Cir. 1977), the Court in finding section 308 conferred sufficient authority for requiring monitoring of cooling water intake structures independent of a cost benefit analysis, said, "... we trust that EPA will conduct a limited cost-benefit analysis once the information on which an evaluation of the various technologies can be made becomes available." Hudson Riverkeeper Fund, Inc. v. Orange Rockland Util., Inc., 835 F. Supp. 160, 165-66 (S.D.N.Y. 1993). For these reasons, EPA believes it reasonable to interpret the unique phrase "best technology available for minimizing adverse environmental impact" in a manner that allows EPA to consider cost.

Precisely how to consider cost in the context of the 316(b) rule for new facilities has been a matter of some dispute. EPA has long stated that neither the statute nor the legislative history requires a formal or informal cost-benefit assessment. 41 Fed. Reg. 17,387 (April 26, 1976). The 1976 preamble also stated that the term

---

[Footer omitted in printing.]

"best technology available" should be interpreted as best technology available at an economically practicable cost." See 118 CONG. REC 33,762 (1972), reprinted in 1 Legislative History of the Water Pollution Control Act Amendments of 1972, at 264 (1973)(Statement of Representative Don H. Clausen.).

Historically, the EPA Administrator has addressed this issue in the context of several formal adjudications in which he determined that no formal cost benefit balancing was required but that costs could be considered if wholly disproportionate to the environmental benefit. See In the Matter of Public Service Company of New Hampshire, et al., (Seabrook Station Units 1 and 2) NPDES Case No. 76-7 (NPDES Permit Application No. NH 0020338; 1977 NPDES LEXIS 6 (June 10, 1977), where the Administrator overturned the decision of the Regional Administrator who at the time, advocated that section 316(b) required cost/benefit balancing. The Administrator held that "there is nothing in section 316(b) indicating that a cost/benefit analysis should be done." At the same time, the Administrator stated that "I do not believe it is reasonable to interpret Section 316(b) as requiring use of technology whose cost is wholly disproportionate to the environmental benefit to be gained." See also Decision of the General Counsel, No. 63 In re Central Hudson Gas and Electric Corp., (July 29, 1977). This "wholly disproportionate" test has also been applied in the effluent guidelines program with respect to the first stage of technology controls, "best practicable technology." See Rybachek v. EPA, 904 F.2d 1276 (9th Cir. 1990); CMA v. EPA, 870 F.2d 177 (5th Cir. 1989);

[Footer omitted in printing.]

Association of Pacific Fisheries, 615 F.2d 794 (9th Cir 1980).

In this rule for new facilities, after notice and comment rulemaking, EPA has adopted an approach to considering costs that is analogous to how costs are considered in establishing new source performance standards for new sources "best available demonstrated control technology", and for effluent limitations guidelines for existing sources under the second (1983) level of control for certain pollutants, "best available technology." As stated in the preamble to the proposed rule, this position reflects congressional concern that the application of best technology available should not impose an impracticable and unbearable economic burden. 65 Fed. Reg. 49094 (August 10, 2000). EPA believes this approach is appropriate for new facilities. Thus at proposal, and in this final rule governing new facility cooling water intake structures, EPA has examined cost to revenue ratios and potential barriers to entry in a manner analogous to how it looks at economic achievability for certain effluent limitations guidelines and all new source performance standards. As a supplementary analysis, EPA has found it reasonable to consider the incremental effectiveness (in terms of reductions in impingement and entrainment) as compared to the incremental cost of various technologies. EPA believes that the unique phrase "minimizing adverse environmental impact" in CWA section 316(b) supports an interpretation that considers the practicability and reasonableness of incrementally stringent measures, including, among other things, economic considerations. This is consistent with

several decisions interpreting the role of costs under BAT effluent limitations guidelines. For example, in American Petroleum Institute v. E.P.A., 787 F.2d 965, 972 (5th Cir. 1986), the court upheld certain controls on trace amounts of mercury and cadmium because the costs of the limitations would not be significant. At the same time, the Court stated, "Indeed, EPA would disserve its mandate were it to tilt at windmills by imposing BAT limitations which removed de minimis amounts of polluting agents from out nation's waters, while imposing possibly disabling costs upon the regulated industry." This approach is analogous to EPA's decision not to require controls based on dry cooling, as discussed in the preamble to the final rule.

EPA disagrees that the incremental costs of installing and operating dry cooling systems are relatively insignificant in the context of the electric generating industry's overall capital costs, revenues, and profits.

EPA's economic analysis of the dry cooling alternative for the final rule demonstrates that all 83 power plants will experience cost to revenue impacts greater than 4% for a zero or near-zero intake requirement. Twelve plants will experience cost to revenue impacts greater than 10%. As such, EPA challenges assertions that the incremental costs of dry cooling systems are insignificant in any context.

As discussed in the notice of data availability EPA has estimated compliance costs of a dry cooling including the replacement power costs of the energy penalty. See response to comment 316bNFR.068.332 and 66 FR 28066. In addition, the number of new power plants projected within the scope of the rule has

increased since proposal. See the preamble to the final rule. As such, the costs quoted by the commenter regarding the proposal estimates of the dry cooling option have changed significantly. The final rule analysis, which includes the contribution of the energy penalty to the recurring annual costs, projects that the total annualized cost for the dry cooling alternative is $490 million (in 2000 dollars). EPA notes that the vast majority of costs associated with this option are incurred at the 83 power plants, and not at the 38 manufacturers. Because dry cooling is not a feasible option for all manufacturing facilities (see response to comment 316bNFR.028.022 and section V.C-4 of the preamble to the final rule), EPA only applied costs of recirculating wet cooling towers to these types of facilities. Therefore, of the $490 million dollars in annualized cost for the dry cooling option, the 83 power plants accept the most sizable burden. The cost to revenue impacts of this regulatory option, as noted above, would far exceed the values estimated by the commenter. For direct comparison, the average cost to revenue per power plant would be greater that 4.0% for all power plants. EPA considers this level of cost to revenue impacts to be significant. In comparison, the cost to revenue impacts of the final rule, which is based in part on flow reduction commensurate with that achieved using recirculating closed-cycle wet cooling, do not exceed 3.0 percent for a single facility, and the vast majority of the impacts are below 1.0 percent.

The statement made by the commenter about the reduced need for steam condensation at combined-cycle power plants is supportive of the points EPA has made regarding the true size of the dry cooling installations

at what the commenter deems large demonstrated cases. (See response to comment 316bNFR.206.013 for further discussion.)

EPA disagrees that dry cooling costs at today's combined-cycle facilities "are roughly equivalent to the costs for installing a wet system at a conventional coal-fired facility." This assertion is misleading and untrue. A comparison of capital costs between equally sized combined-cycle plants for wet and dry cooling tower systems reveals that the dry cooling plant's capital costs would exceed those of the wet cooling tower plant by 3.3 fold. The installed wet cooling tower capital cost is approximately $9.98 million, while the dry cooling installation would cost approximately $33.4 million. For a typical, modern 700-MW combined-cycle power plant, these erected capital costs represent approximately less than 2 percent for wet cooling and approximately 7 percent for dry cooling of the total capital cost of the power plant construction project. (See "example_dry_v_wet.cost.xls" in the docket.) Hence, the erected capital costs of dry cooling systems as compared to wet cooling towers for the same sized 700-MW combined-cycle power plant are significantly more expensive and by no means "insignificant." EPA notes that this is simply the erected capital cost and does not include the operation and maintenance costs associated with these two types of cooling systems. The operation and maintenance costs of the wet cooling tower (without including the effects of energy penalties) would be $1.8 million per year, while the dry cooling system would cost $7.4 million per annum. Without incorporating energy penalties, the ratio of operation and maintenance costs of dry cooling to wet

cooling for a typical 700-MW combined-cycle power plant would be approximately 4 to 1. After factoring in the recurring costs of energy penalties at the two plants, the recurring annual costs increase to approximately $2.3 million for the wet tower plant and $10 million for the dry cooling plant. This corresponds to a dry to wet ratio greater than 4 to 1. The total annualized costs of these systems are estimated at $3 million for the wet cooling tower system and $13 million for the dry cooling system (a ratio of greater than 4 to 1).

EPA estimates that the capital cost of a wet cooling tower installation at a 700-MW coal-fired plant (i.e., of the same capacity as the combined-cycle plant described in the preceding paragraph), the total erected capital cost of a cooling tower system would be approximately $15.5 million. This shows that the commenter is incorrect in claiming that comparative costs of coal-fired plants with wet towers to those of dry cooled combined-cycle plants of equal capacity (in megawatts) are "roughly equivalent." The ratio of erected capital costs for dry cooling at a typical 700-MW combined-cycle plant to wet towers at a typical 700-MW coal-fired plant is 2.2. Similar ratios are seen for operation and maintenance costs, energy penalty costs, and total annualized costs. EPA disagrees that this is even a reasonable comparison, but includes the results as evidence that the commenter's statements are without factual basis.

EPA notes that in the commenter's footnote 82, the reference states, "despite assembling some evidence suggesting that the capital cost and operations and maintenance costs of air-cooled structures are lower

than suggested by EPA, Tellus nevertheless used the EPA values in its calculations." EPA points out that the referenced report provides no evidence of this claim and provides no data to counter EPA's estimates.

With respect to the commenter's statement regarding the abundance of dry cooling applications, EPA questions the basis for the statement that "the emphasis in many states in recent years has been on 'zero discharge' facilities." The commenter does not expand on the types of "facilities" they mean. By inference EPA must assume that the commenter implies power plant facilities. If this is the case, then the commenter exaggerates trends in production of dry cooling versus wet cooling for recent power plant projects. As pointed out in comment 316bNFR.525.204, in the 1995 to 1999 five-year period, approximately 380 MW of new power plants were constructed with dry cooling (corresponding to a 2.5 percent growth in dry cooling usage). During this same period, over 10,000 MW of new growth with wet cooling came on-line (a 1.2 percent growth in wet cooling usage). To EPA, this data does not imply that the emphasis in many states in recent years has been on zero-discharge power plants.

With respect to European political motivations for development of policies concerning water usage, EPA believes that it is nevertheless appropriate for the U.S. to balance factors relevant here as articulated in the preamble to the final rule.

EPA agrees that in select climates, and for select types of facilities, dry cooling systems are 1 to 2 percent less efficient in cooling of plant condensers than wet cooling systems. EPA adds that this is true

only for combined-cycle plants, where the mean annual energy penalty (averaged across climates) is 2.1 percent for dry cooling compared to once-through systems. However, for many other cases, the energy penalty is dramatically higher for dry cooling compared to either once-through or wet cooling towers. For instance, southern climates see a significant energy penalty, and coal-fired plants show mean annual penalties (averaged across climates) of 8.6 percent. In addition, the peak summer shortfalls during hot periods can be debilitating. These shortfalls range from 2.4 percent in the best case to 12.3 percent in the worst. See Chapter 3 of the Technical Development Document.

EPA disagrees that energy transmission efficiencies should factor into a consideration of the relative efficiency of any cooling system, let alone for future power plants whose siting will be influenced by many factors outside the scope of this rule. First, there is no information provided by the commenter, nor any reason given, to view a regulatory option based on dry cooling as to encourage location of plants closer to consumers. Considering that land costs are generally more expensive near and in urban areas, and that the dry cooling systems require significantly more land than comparably sized wet systems, the commenter's assertions are without merit, nor do they address the issue of public opposition to power plant construction. Second, electricity is delivered to a grid, which then delivers power to consumers. This is especially true today with the advent of deregulated markets. As pointed out in footnote 85 to the comment, the transmission losses are assigned to the grid, as a whole,

not individual plants. Therefore, the loss of electricity for plants supplying to a grid, which then delivers to consumers (often over long distances) would be the same for power plants located nearby or great distances from the end consumer. Even if the distance between generator and consumer is appreciably shortened, which EPA views as a misconception, the necessary voltage step-up at the plant, the voltage step-down at the distribution station, and a further voltage step-down for the consumer represent fixed losses that are independent of the distance the electricity moves.

In addition, EPA contends that the efficiency losses (i.e., energy penalties) of an alternative based on dry cooling are not "minor." In fact, the 1900 MW of lost energy capacity projected for the dry cooling alternative is anything but minor, in EPA's view. The equivalent of two very large or three large power plants would need to be constructed to overcome the energy losses of the dry cooling alternative. The air emissions increases as a result of this replacement capacity, if they were to come from increased generation across the US market, would be equivalent to those of three new 800MW coal-fired power plants. Alternatively, if the replacement capacity would be new capacity exclusively, it would be dry cooling equipped plants with the associated elevated capital and annual costs and land area requirements. Therefore, EPA considers the issue of inefficiency of dry cooling, and EPA's subsequent rejection of the dry cooling alternative, to be principal to the concept of energy conservation. Considering that the State of California recently experienced shortages of demand

less than the energy penalty of the dry cooling option, the imposition of 1900 MW of mean annual energy penalty capacity loss on planned new power plants does not support the Administration's Energy Plan and associated Executive Orders.

EPA disagrees with the statement that, in cold climates, dry cooling systems can actually be more efficient at removing heat than a comparable wet-cooling system. This statement is patently false. As discussed in comments 316bNFR.524.201, 316bNFR.368.004, and 316bNFR.056.044, the practical limitations of the dry cooling system, as limited by the dry bulb temperature, which is always equal to or greater than the wet bulb temperature met by wet cooling systems, prevent its performance from exceeding that of wet cooling. Moreover, increased parasitic fan loads for dry cooling systems will ensure that the technology will not operate as efficiently as a comparable wet cooling system.

EPA disagrees that system-wide efficiency of a power plant is a relevant basis for dismissal of energy penalties. The projected power plants within the scope of this rule will primarily utilize combined-cycle designs and modern coal-fired designs, while small amounts of the new generating capacity within the scope of this rule may be in the form of cogeneration. The efficiency of the electricity production process is directly affected by the cooling system to be installed. The vast majority of projected new plants (i.e., 90 percent) would install closed-cycle recirculating cooling towers, regardless of the requirements of this rule. Therefore, EPA's technology-based performance requirements for final rule, which are based, in part, on

---

[Footer omitted in printing.]

recirculating closed-cycle cooling would impose potential changes in cooling system designs on only nine new plants. The comparable effect on the efficiency of these plants will be small on a facility level and national basis. See Chapter 3 of the Technical Development Document. However, a regulatory alternative based on dry cooling would impose cooling system design changes on each of the 83 power plants within the scope of the final rule. Therefore, each of the 14 projected coal-fired plants would experience a mean annual energy penalty of approximately 8.6 percent. As stated by the commenter, the typical steam electric generator (such as these coal-fired plants) would, at peak operation, operate at approximately 40 percent efficiency. The energy penalty of nearly 9 percent is very significant when compared to the system-wide energy efficiency of this type of power plant. Additionally, each of the 69 projected new combined-cycle plants would see a mean annual energy penalty of approximately 2.1 percent. With new design efficiencies of 60 percent, at peak operating efficiency, a 2.1 percent energy penalty is less striking than in the coal-fired cases. However, the cumulative effect for all 69 power plants is significant. EPA views energy loss as a more serious matter than the commenter, and disagrees that improvements in energy efficiency of modern plants would "dwarf" losses through the dry cooling systems.

Furthermore, EPA seeks to encourage replacement of older facilities with new combined-cycle facilities. By basing the requirements of the rule on dry cooling, EPA would create a disincentive to replacement of an older existing facility with a new facility due to a

---

[Footer omitted in printing.]

significant increase in annualized costs. Instead, generators would have an incentive to modify existing plants in a manner that would prevent them from being controlled by this rule.

The quotation from the director of PG&E is interesting, but hardly an endorsement of a technology. Although EPA supports dry cooling where a facility elects to use it (it would qualify for Track I), EPA is concerned for the reasons stated in the preamble and in this response about the downsides of requiring dry cooling on a national basis.

The statement made by the commenter that "approximately 27 percent of new capacity since 1985 has used dry cooling," is not substantiated and, in EPA's view, misleading. The commenter does not state where the new capacity has been constructed. As described in substantiated comments that EPA received to the notice of data availability, in the period from 1990 to 1999 only 36 dry cooled power plants worldwide were built with capacities greater than 50 MW. Of these, only 10 were constructed in the US; only one of these 10 had a capacity greater than 200 MW. Seventy-five percent of the dry cooling systems constructed in the last decade were not in the United States. See comment 316bNFR.524.204.

[Graphic omitted] William McCracken
<mccrackw@michagan.gov>
To: Claudio Ternieden/DC/USEPA/US@EPA
cc:
Subject: Re: 316(b) Burden

01/24/02 05:37 PM

I am the Chief of the Permits Section, Surface Water Quality Division, Michigan Department of Environmental Quality.

>>> <Ternieden.Claudio@epamail.epa.gov> 01/24/02 05:33PM >>>

Mr. McCracken,

What is your position title, office, etc with Michigan DEQ? We will need that for the record. Thanks again for your help and information.

CLaudio

William McCracken <mccrackw@michigan.gov> 01/24/02	To: Claudio Ternieden/DC/USEPA/US@EPA cc: William Creal <CREALW@michigan.gov>, Daniel Dell <DELLD@michigan.gov>, Jeffrey Fischer <FISCHEJJ@michigan.gov>, James Grant <GRANTJE@michagan.gov>, David Hamilton

04:16 PM <HAMILTOD@michagan.gov>,Asad Quraishi <AURAISHA@michgan.gov>

Subject: 316(b) Burden

As we discussed, I believe there would be a considerable burden on the NPDES permitting program in Michigan if the 316(b) regulations for existing facilities require environmental effects studies at individual facilities. My experience indicates that studies of the effects of cooling water intake structures on the receiving water fisheries are extremely difficult to do and the results are difficult to interpret. The burden would be considerably reduced if the regulations require specific cooling water intake structure technology. Also, this approach would seem to me to be consistent with the intent of section 316(b).

I trust this information is helpful. Regards, Bill McCracken

Frank Ackerman, Ph.D.[1]
Global Development and
Environment Institute
Cabot Center
Tufts University
Medford MA 02155

August 1, 2002

Cooling Water Intake Structure (Existing Facilities: Phase II)
Proposed Rule Comment Clerk — W-00-32
Water Docket, Mail Code 4101
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue N.W.
Washington D.C. 20460

Re: Comments on Proposed Rule, RIN 2040-AD62
Clean Water Act §316(b) — National Pollutant Discharge Elimination System —
Proposed Regulations for Cooling Water Intake Structures at Phase II Existing Facilities, EPA ICR no. 2060.01

Dear Sir/Madam:

I am pleased to have the opportunity to submit these comments on the above-captioned rulemaking. My comments address EPA's analysis of benefits for, and the role of cost-benefit analysis in, this rulemaking proceedings. Briefly stated, EPA's analysis of the

---

[1] Research Director, Global Development and Environment Institute, and Research Assistant Professor, Department of Urban and Environmental Policy and Planning, Tufts University. These comments are not being submitted in my official capacity at Tufts University. My comments are being submitted on behalf of Riverkeeper.

benefits of reduced cooling water intake is seriously incomplete, and should be considered as no more than an extreme lower bound on the complete benefits. A simple quantitative adjustment, filling in just two of the many gaps in EPA's estimate of benefits and drawing on more recent economic literature than EPA has used, results in substantially greater benefits for every option EPA is considering, and show that EPA's proposed option does not maximize net social benefits. To be sure, my adjustments remain incomplete; they do not come close to capturing all of the benefits of regulating cooling water intake structures. Nevertheless, my estimates are sufficient to demonstrate that policy options involving greater reduction in water intake create greater net benefits than the proposed option.

These comments also examine the methodological problems of valuation of the environmental benefits involved in this case. Natural ecosystems, such as the aquatic ecosystems affected by cooling water intake, provide numerous interrelated services, some of which are clearly valuable but difficult to quantify. Assigning a zero value to these benefits would misstate society's preferences and values. Yet rigid insistence on applying a single, narrowly defined valuation methodology to every benefit would, in effect, dismiss (that is, value at zero) all hard-to-quantify environmental values. For this reason, EPA's analysts should be commended for exploring valuation methodologies such as habitat-based replacement cost (HRC) and societal revealed preferences, which have the potential to address the full range of ecosystem services. The problems with these alternative

methodologies are that they do not go far enough, and cannot be consistently applied across the board.

In addressing the methodological problems, I also respond to aspects of the comments on this rule by Dr. Robert Stavins. Commenting on behalf of PG&E National Energy Group, one of the major corporations that has a direct financial interest in the outcome of this rulemaking procedure, Dr. Stavins reaches conclusions opposite to mine, arguing that all methodological innovations in benefits valuation in this case are illegitimate and that many EPA benefit estimates are drastic overestimates. Throughout his comments, he inaccurately suggests that he speaks for all economists. However, he neglects to document the supposed unanimity of economists on these issues, repeatedly offering only his own personal authority as evidence for the views of the entire profession. In my comments I describe the ongoing differences among economists, including recent Nobel Prize winners, on the issues at stake in this case.

Here I will focus on three of the numerous points on which I disagree with Dr. Stavins: the treatment of non-use values, the basis for habitat replacement cost estimates, and the validity of societal revealed preferences. My conclusions on these issues, in short, are that

- Dr. Stavins ignores the extensive evidence that EPA's non-use values are conservative underestimates;
- Habitat replacement cost valuation is similar to standard approaches to asset valuation used through the economics literature, and provides a

reasonable approach to valuation of large but uncertain ecosystem benefits; and

- Societal revealed preference is a reasonable approach to the problems of social choice, which are intrinsically different from the individual choice paradigm that is assumed in Dr. Stavins' preferred approach.

Finally, despite our differences, Dr. Stavins and I agree that there are enormous methodological difficulties in complete valuation of the benefits of reducing cooling water intake requirements, but we disagree about the implications of these challenges. Dr. Stavins urges EPA to wait to regulate until the valuation methodologies of economists catch up to the environmental aspirations of the Clean Water Act. I, in contrast, conclude that the difficulties in valuing environmental benefits illustrate the limits to the usefulness of cost-benefit analysis in the environmental setting. In contrast to the cost-benefit analysis EPA now appears to endorse, identification of the best available technology is a process in which costs are only one of many factors to be considered, and benefits need not be precisely quantified and monetized in order to be taken seriously. A recommendation based on the best available technology could be made, as has been done for numerous regulations in the past, without entangling the agency in the massive web of methodological, technical, and even philosophical challenges to cost-benefit calculations.

My detailed comments are organized in the following sections:

1. Evidence of the incompleteness of EPA's benefit estimates

2. Adjustment of EPA benefit estimates to address selected problems of incompleteness
3. General comments on Dr. Stavins' arguments
4. Survey of non-use values and updated estimates of their magnitude
5. Rationale for use of habitat replacement cost
6. Problems of social choice and the use of societal revealed preference
7. Limitations of cost-benefit analysis and merits of the "best available technology" standard

1. The incompleteness of EPA's benefit estimates

Cost-benefit analysis is designed to weigh the relevant costs of a proposal against the corresponding benefits. This process cannot yield a meaningful result unless the calculations of costs and benefits are equally complete. In the private sector, a balance sheet that weighs all of a company's income against *some* of its expenditures does not provide a useful picture of the company's true financial condition, as recent corporate scandals have reminded us. Likewise, in the public sector, a comparison of complete costs and incomplete benefits does not provide an accurate picture of net benefits to society.

Yet a comparison of complete costs and incomplete benefits is exactly what EPA has produced in this case. The costs of reducing the impacts of cooling water intake are monetary costs for marketed goods and services, such as production and installation of screens, cooling towers, and other equipment. Such costs are backed up by detailed engineering analyses, and often by recent experience in buying and installing similar

equipment. There are no categories of costs which are intrinsically difficult to express in monetary terms.

Contrast this with the calculation of the benefits of reducing cooling water intake. In general terms, the benefits consist of reduced damage to aquatic ecosystems. But how should those benefits be measured and monetized? EPA's analysis focuses on a more restricted question, namely valuing the benefits of killing fewer fish; this is already a complex problem with no simple answers. Market prices are available only for a few commercially valuable fish species; even when available, commercial prices do not necessarily capture all the value of avoided fish mortality. And avoided fish kills are far from the only significant benefits of reduced ecosystem damages, since many other organisms and environmental services are also affected.

EPA's economic benefit analysis (EBA) explicitly describes the categories of benefits that have been omitted. EBA Chapter C1, particularly section C1-5, lists the following reasons why the environmental impacts of cooling water intake structures, and consequently the benefits of regulating them, are underestimated:

- Facility-provided monitoring data, the basis for EPA's analysis, typically focus on only a subset of the species impacted by impingement and entrainment (I&E), thus underestimating total losses.
- Monitoring data often pertain to conditions existing many years ago, before the Clean Water Act had improved aquatic conditions; if the numbers and diversity of fish were depressed by degraded water

quality, estimates of I&E losses would be similarly low.

- Cumulative impacts of multiple facilities on the same fish population are often important, but have been considered only to a limited extent.
- Estimated recreational and commercial values include only the proportion of I&E losses that would have been caught, typically less than 20 percent of I&E mortality of recreationally and commercially valuable species.
- Secondary economic impacts such as effects on marinas, bait sales, and property values have not been included.
- Losses of invertebrate species such as lobsters, mussels, crabs, and shrimp were not included, even though these include commercially valuable species.
- Effects on fish-eating (piscivorous) birds were not included.
- Current fishing mortality rates often reflect already-depleted fisheries, as for example in the case of winter flounder near the Brayton Point facility, one of the EBA case studies.
- Forage species, accounting for the predominant share of I&E losses, are poorly documented, and their full ecological value to the food web is not considered.
- Non-use benefits are estimated only for recreational users, not for the population as a whole.
- Thermal impact reductions are not accounted for in some options, such as replacement of once-through cooling with cooling towers.

Another portion of the EBA, Case Study Chapter A11, re-examines the areas of incompleteness from a different perspective, focusing on the ecological services that are disrupted by I&E, but are not addressed by conventional valuation methods. Quoting directly from the EBA, those omitted or undervalued services include:

- decreased numbers of ecological keystone, rare, or sensitive species;
- decreased numbers of popular species that are not fished, perhaps because the fishery is closed;
- decreased numbers of special status (e.g., threatened or endangered) species;
- increased numbers of exotic or disruptive species that compete well in the absence of species lost to I&E;
- disruption of ecological niches and ecological strategies used by aquatic species;
- disruption of organic carbon and nutrient transfer through the food web;
- disruption of energy transfer through the food web;
- decreased local biodiversity;
- disruption of predator-prey relationships...
- disruption of age class structures of species;
- disruption of natural selection processes;
- disruption of public uses other than fishing, such as diving, boating, and birding; and
- disruption of public satisfaction with a healthy ecosystem.

(EBA Case Studies, p. A11-2.)

This second list is presented as part of the rationale for HRC valuation, a method that can encompass the

full diversity of ecosystem values. My comments on HRC appear in section 5 below.

It would be impossible in practice to estimate all of these omitted values. However, benefit analyses for other proposed rules have estimated a broader set of values. For example, the economic and environmental benefits analysis for the metal products and machinery (MP&M) rule estimated separate recreational benefits for fishing, other boating, and wildlife viewing and near-water activities. Recreational fishing accounted for only one-fourth of all recreational benefits from reduced MP&M discharges.[2] EPA has now issued a Notice of Data Availability for the MP&M rule; it suggests that the estimates of recreational benefits were increased in response to peer reviewers' comments.[3] If similar relationships hold for the recreational benefits of reductions in cooling water intake, then EPA's estimates of recreational benefits in the 316(b) analysis should be multiplied by 4 or more. However, the data needed to determine the magnitude of other recreational benefits are not presented in the EBA. I recommend that EPA should explore the impacts of cooling water intake structures on the other recreational benefits considered in the MP&M analysis, and increase its estimates of recreational benefits of cooling water intake reduction whenever appropriate.

---

[2] *Economic, Environmental and Benefits Analysis for the Proposed Metal Products and Machinery Rule* (EPA 821-B-00-0008, December 2000, available at www.epa.gov/waterscience/guide/mpm/rule.html). Chapter 15; the results in Table 15-13, p.15-17, show that recreational fishing accounts for 24% of the midpoint values for recreation benefits as a whole.

[3] *Federal Register*, June 5, 2002, p. 38774.

The two lists of omissions and underestimates presented here — both taken directly from the EBA — are more than sufficient to demonstrate the incompleteness of the benefits analysis in this case. Complete costs are being compared to a restricted subset of benefits; the bottom line of such a lopsided comparison slants heavily in a predictable direction, toward "justifying" less regulation and weaker environmental protection than a complete analysis would support. All that can be concluded from this misleading, incomplete comparison is that true, complete benefits must be larger, and net social benefits larger as well, for each of the various options under consideration.

2. *Summary account of adjustment of EPA benefit estimates*

I have prepared an adjusted set of figures incorporating estimates of corrections to just two of EPA's omissions and underestimates. This section presents my calculations; the rationale for the first correction appears in section 4 below.

My first adjustment is for the underestimate of non-use benefits. As I discuss in section 4, a recent literature review finds that non-use benefits are on average 1.9 – 2.5 times all use values, rather than 0.5 times recreational benefits alone as EPA assumed. My reading of the recent literature suggests that 1.9 – 2.5 times use value is still a conservative estimate for existence values of many natural ecosystems. To correct for EPA's underestimate in this area, I have recalculated their estimates assuming that non-use values are 2 times estimated recreational, commercial, and forage values.

My second adjustment is for the unvalued fraction of the mortality of recreationally and commercially valuable species. EPA's methodology values only the fraction of those species that would have been caught in the absence of I&E mortality. That is, I&E mortality rates are adjusted downward in proportion to historical catch rates before any valuation occurs in the EBA. Only the fraction of the fish that would have been caught are assigned any value; the rest are ignored. The catch rate, or "landed fraction," is below 20% in every case, and below 10% in some cases.[4] Thus the great majority of I&E mortality of the most valuable species is never valued.

The nonlanded fraction of these species — the ones that survive uncaught — have an obvious ecological value. If nothing else, their reproduction is the source of the catch in future years; that is, they are essential to the creation of future recreational and commercial values. A catch rate of 100%, if it occurs, can only occur once. The available data do not allow calculation of the present value of future reproduction of nonlanded fish; the calculation would be complex and would likely vary by species. It seems reasonable to assume that nonlanded fish have a value that is significantly greater than zero, but not more than the value of the landed

---

[4] Data on the landed fraction of commercially and recreationally valuable species can be found in the EBA for every case study except Ohio. EPA's answers to Riverkeeper questions, received very late in the process of my analysis, imply a landed fraction of about 1-2% for Ohio; this appeared remarkably out of line with other case studies. My calculations conservatively assume a landed fraction of 10% for the Ohio case study. Use of EPA's Ohio data would lead to higher estimates of benefits in my Scenarios B and C in Table 1, below.

(caught) fish of the same species. I have conservatively assumed that nonlanded fish have a value equal to 0.25 times the value of landed fish of the same species. That is, I have created a new category of inferred recreational and commercial value in the case studies, as follows:

Value of nonlanded recreational and commercial fish	=	*Value of landed recreational and commercial fish) x (nonlanded fraction / landed fraction)* x *0.25*

To calculate the effects of these adjustments, it was first necessary to construct a spreadsheet system that reproduces EPA's estimates. This spreadsheet reproduces in detail the benefit categories for each of the EBA case studies, extrapolates to best estimates of national baseline losses using the relationships described in the EBA, and then adjusts for the percentage reduction in losses achieved by each EBA policy option.[5] My spreadsheet calculates national baseline losses, and benefits of each policy option,

---

[5] In additional stage of adjustments would have been necessary to convert to the policy options as presented in the Federal Register. EPA's explanation of these adjustments, in response to my questions, was received late in the process of my analysis. Therefore I did not develop calculations to match the Federal Register categories. In several of the key cases, EPA's estimates of Federal Register options benefits are about 95% of corresponding EBA benefits, suggesting that my conclusions apply almost equally to Federal Register options. The difference between Federal Register and EBA benefits includes both the distinction between estimates for 539 vs. 550 plants, and differences in the treatment of taxes.

replicating EPA's values when using EPA's assumptions.

I then recalculated the spreadsheet three times: in Scenario A, keeping all EPA assumptions and input data, except assuming that non-use value is 2 times recreational, commercial and forage value; in Scenario B, restoring EPA's non-use assumption but assuming that nonlanded recreational and commercial fish are valued according to the above equation; and in Scenario C, combining my two assumptions. The results, as shown in Table 1 (next page), are:

- Estimated benefits of each policy option are more than doubled in Scenario A, relative to the estimates in the EBA;
- Estimated benefits of each policy option are roughly doubled in Scenario B; and
- In Scenario C, combining my two adjustments, benefits of policy options are roughly 4–6 times the estimates in the EBA.

When compared to the costs of the policy options, as reported in the EBA, my three scenarios of course have much greater net social benefits. The order of policy options, ranked according to net social benefits, is changed: Option 5 – the dry cooling option – has the greatest net benefit in all three scenarios, as shown in Table 2. In Scenario C, combining the two adjustments, EPA's proposed option, i.e. EBA Option 3, is the one that fares worst. Options 1, 2, 3a, and 4 all have net benefits of $4.1 – $4.5 billion in Scenario C.

Because my rough estimates of these two changes have such a large effect on the outcome of the analysis,

I recommend that EPA explore both issues in greater detail. Specifically,

1. EPA should develop approaches to non-use value more consistent with the recent economic literature, to replace the outmoded "50% rule" used in the EBA; and
2. EPA should develop plausible values for the nonlanded fraction of I&E fish mortality. The one thing we know for certain is that the current estimate of zero is *not* the correct value.

An enormous amount is at stake here: my two adjustments show that all options have large net benefits, and that EPA's incomplete valuation of benefits misleadingly favors the option that has the lowest net benefits on a corrected basis. Thus it is important that EPA explore these corrections in detail.

Table 1: Benefits of EBA Policy Options

(millions of dollars)

Option	EBA	Scenarios A	Scenarios B	Scenarios C
1	$ 1,034	$ 2,348	$ 2,091	$ 5,517
2	$ 890	$ 2,043	$ 1,814	$ 4,815
3	$ 735	$ 1,705	$ 1,515	$ 4,047
3a	$ 749	$ 1,793	$ 1,693	$ 4,625
4	$ 1,223	$ 2,933	$ 2,775	$ 7,589
5	$ 1,536	$ 3,731	$ 3,553	$ 9,782
6	$ 1,159	$ 2,666	$ 2,362	$ 6,274

Scenario definitions: EPA data and assumptions used except

A: Nonuse value = 2 * recreational, commercial & forage values

B: Nonlanded recreational and commercial fish valued at 0.25 * landed fish of same species

C: Combines assumptions of A and B

Table 2: Net Benefits of EBA Policy Options

(millions of dollars)

		Net Benefits			
			Scenario		
Option	*Costs*	EBA	A	B	C
1	*$ 969*	$ 65	$1,379	$1,122	$4,548
2	*$ 610*	$ 280	$1,433	$1,204	$4,205
3	*$ 283*	$ 452	$1,422	$1,232	$3,764
3a	*$ 300*	$ 449	$1,493	$1,393	$4,325
4	*$ 3,507*	$(2,284)	$ (574)	$ (732)	$4,082
5	*$ 2,054*	$ (518)	$1,677	$1,499	$7,728

Costs for Option 6 were not calculated in the EBA.

3. General comments on Dr. Stavins' arguments

Dr. Stavins argues repeatedly that EPA's benefits analysis violates the canons of approved economic theory. As he says on page 1, "some of the methodologies employed are neither recommended nor endorsed by EPA's own *Guidelines for Preparing Economic Analysis...*" This is the first of at least 16 mentions of the *Guidelines* in his 43 pages of comments; it is by far his most frequent source, repeatedly cited as the final, definitive source on allowable methods.

However, when the *Guidelines* were first approved, Dr. Stavins had a more flexible view of the document. The *Guidelines* were reviewed by EPA's Science Advisory Board — Environmental Economics Advisory Committee (EEAC), chaired by Dr. Stavins. The EEAC review of the *Guidelines* said, in its Executive Summary,

> Economics, like any scholarly discipline, is constantly changing. Environmental economics, a relatively young branch of the discipline, has experienced particularly rapid growth. New areas of the literature continue to emerge, and existing areas change and expand. Hence, despite the Committee's generally positive assessment of the revised Guidelines, we urge EPA to carry out new reviews every two to three years.[6]

---

[6] Science Advisory Board Report on the EPA Guidelines for Preparing Economic Analysis, published as Appendix A to the *Guidelines*, p.1.

The cover letter signed by Dr. Stavins, transmitting the EEAC review of the *Guidelines* to Carol Browner, the EPA Administrator at the time, likewise said,

> The best analytical tools of environmental economics are constantly changing, as experience with applications of existing tools and as new theoretical and empirical techniques appear in the scholarly literature. As a result, it is important that EPA carry out new reviews of the Guidelines every two to three years to reflect these developments in environmental economics.[7]

Although the *Guidelines* were officially published in September 2000, the EEAC review occurred in 1998-99; the cover letter to Carol Browner is dated September 30, 1999. Thus it is now three years later, the time at which, according to the EEAC — and the Dr. Stavins of 1999 — a new review of the *Guidelines* would be called for. Dr. Stavins got it right the first time, in 1999: environmental economics is a fast-changing field, and it is important to take a fresh look at it, rather than being bound by scriptural references to a report from some years ago.

Looking more generally at the world of environmental economics and policy analysis, the choice of techniques for valuation of benefits, and the application of cost-benefit analysis to legal and regulatory issues, remain the subjects of active debate. Recent special issues of the *Journal of Legal Studies* and the *University of Pennsylvania Law Review* have

---

[7] Letter to Carol Browner from Joan Daisey and Robert Stavins, September 30, 1999, included in Appendix A of the *Guidelines*.

highlighted the ongoing differences of perspective on these issues among legal scholars and economists.[8]

The economics profession as a whole is exhibiting an increasing interest in alternative perspectives that question the conventional textbook wisdom. Two of the last four Nobel Prizes in economics have gone to scholars who are famous for their unorthodox views. Amartya Sen, the 1998 Nobel laureate, has raised fundamental questions about the nature of social choice, ethics, and equity in economics, including recent comments on cost-benefit analysis that I will discuss in section 6 below. The 2001 prize went to Joseph Stiglitz, George Akerlof, and Michael Spence, economists who have analyzed the problems of imperfect and asymmetric information — problems that require fundamental rethinking of the optimality of markets, and create a strong case for the benefits of regulation.

Several "heterodox" schools of economics have emerged in recent years, raising questions and developing methodologies that go beyond the conventional limits of economic theory. Ecological economics is one of the fastest-growing new perspectives, represented by the International Society for Ecological Economics and the journal *Ecological Economics*. Alternative approaches to ecosystem valuation, and studies of the role of "natural capital," are frequent topics that have received insightful

---

[8] *Journal of Legal Studies* 29 no. 2, part 2, June 2000, and *University of Pennsylvania Law Review* 150 no. 5, May 2002, are both devoted to discussion of cost-benefit analysis. For my own views on the discussion see Frank Ackerman and Lisa Heinzerling, "Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection," *University of Pennsylvania Law Review* 150 no. 5, 1553-1584.

analysis by ecological economists, with direct relevance to the issues raised in the current rulemaking procedure.

In short, it is increasingly inaccurate to say that there is a single, narrowly defined approach to economic theory, environmental economics, or the evaluation of ecological benefits. If EPA's past guidelines for economic analysis were as rigidly defined as Dr. Stavins now suggests, perhaps EPA should begin the next review of those guidelines with a broader representation of the full range of contemporary views on environmental economics. As Dr. Stavins anticipated in 1999, it is now time for a fresh look at the progress of the field.

4. Survey of non-use values and updated estimates of their magnitudes

EPA's approach to non-use values is one of the least defensible aspects of the EBA. Environmental economics increasingly recognizes the importance of non-use values: people place a substantial value on the mere existence of animals, ecosystems, wildernesses, and unique natural locations, quite apart from any past, present, or planned future use of those aspects of nature. It is frequently the case that existence values dwarf use values: in the Exxon Valdez oil spill, a court awarded compensatory damages -- compensating for lost use values — of less than $300 million to those who lived and worked near Prince William Sound; economists using contingent valuation techniques estimated the existence value of the pristine environment of Prince William Sound at $9 billion, or 30 times use value.

The ratio of non-use value to use value is important here, because EPA uses an unfounded hypothesis about this ratio to estimate non-use value. Based on just a few, very dated citations, EPA suggests that non-use value can be estimated as 50% of the recreational component of use value. EPA notes that this is intended only as an estimate of non-use value to recreational users; there is no reason, however, to restrict the calculation of non-use value to this subset of the population. Here I am happy to agree with Dr. Stavins when he contends that the 50% rule is entirely inappropriate, since it fails to address any of the more recent literature on the subject. We differ, however, on the appropriate alternative.

A 1993 literature review by Thomas Brown — significantly newer and more comprehensive than the sources for the 50% rule — examines 31 contingent valuation studies published since 1980 that have estimated non-use values.[9] Some of these studies contained multiple estimates, leading to 34 comparisons of non-use to use value for the same environmental benefit. The median ratio of non-use to use value was 1.92. After a thoughtful review of the varied methods used in the studies, Brown identifies 22 comparisons that appear to be more reliable than the others; these higher-quality comparisons have a median ratio of 2.56. It is on the basis of this study that I adopted the ratio of non-use to use value of 2 for the purpose of my

---

[9] Thomas C. Brown, "Measuring Nonuse Value: A Comparison of Recent Contingent Valuation Studies," in J.C. Bergstrom, editor, *Benefits and Costs Transfer in Natural Resource Planning*, Sixth Interim Report, University of Georgia, Department of Agricultural and Applied Economics, Athens GA, 1993.

recalculations presented in Tables 1 and 2 above. The Brown study contains a wealth of information about the effects of different methods of estimation on non-use value, and its relationship to use value, beyond the median ratio that I have used. I recommend that EPA explore additional uses of Brown's analysis, in devising more appropriate estimates of non-use value for the case studies.

Revised assumptions about non-use value have a large effect on net benefits. As shown in Table 1, moving from EBA estimates to my Scenario A, introducing the higher non-use value alone, adds $1 – 2 billion to the benefits of the various policy options. Billion-dollar existence values, and more, for nationwide benefits are relatively common in the environmental economics literature.[10] Studies have repeatedly found very large non-use values; these values are best understood as a quantitative expression of widespread public concern about environmental resources — even in the absence of personal use.

One of the studies cited by Brown found a nationwide non-user willingness to pay of $111 per household for improving water quality in all U.S. rivers and lakes to a fishable level — implying a nationwide total value of more than $11 billion in 1981 dollars, or

---

[10] See, among many others, John B. Loomis and Douglas S. White, "Economic Benefits of Rare and Endangered Species: Summary and Meta-analysis", *Ecological Economics* 18 (1996), 197-206; and V. Kerry Smith and Laura L. Osborne, "Do Contingent Valuation Estimates Pass a 'Scope' Test? A Meta-analysis," *Journal of Environmental Economics and Management* 31 (1996), 287-301. The nationwide, per-household values in each of these articles, based on reviews of many other studies, imply multi-billion dollar national totals.

closer to $20 billion in today's dollars.[11] This remarkable figure emphasizes the great importance that people place on water quality, putting the benefit estimates for the current case in a broader perspective. Dr. Stavins' casual and undocumented suggestion that non-use values might be close to zero for this case appears to be quite at odds with the evidence of substantial non-user willingness to pay for improved water quality.

Other studies routinely find vast existence values for endangered species, for clean air in national parks, and other environmental resources and amenities. The surprising value, the figure that is out of line with the recent literature, is the very low estimate of non-use value found in the EBA. Revising this value up to a level more consistent with the literature, as shown in my Scenarios A and C, causes a fundamental change in the evaluation of the policy options considered by EPA.

5. *Rationale for use of habitat replacement cost*

In several of the case studies, the EBA uses calculations of habitat-based replacement cost (HRC) to value the damages due to impingement and entrainment. The rationale for this method is straightforward, although different from other approaches to valuation. Natural ecosystems produce numerous interrelated benefits, some of which are hard

---

[11] Robert C. Mitchell and Richard T. Carson, "An Experiment in Determining Willingness to Pay for National Water Quality Improvements," preliminary draft of a report to EPA, Resources for the Future, 1981, as cited in Brown, supra note 9. My calculations in the text reflect the facts that there are more than 100 million households in the U.S. today, and average prices, as measured by the Consumer Price Index, have almost doubled since 1981.

to quantify (see the lists of omitted benefit categories in section 2 above). Even if they all could be quantified, separate valuation of the entire list of ecosystem services is an impractical task. A simpler approach is to calculate the replacement cost of the ecosystem that provided the array of services.

Restoration cost is used as a measure of damages under CERCLA for Superfund sites, under the National Marine Sanctuaries Act, and under the oil spill provisions of the Clean Water Act. Use of restoration costs was explicitly upheld in the landmark *Ohio vs. Interior* court decision of 1989. I recommend that EPA revise and expand the EBA Case Studies Chapter A11, explaining and supporting HRC calculations, discussing the theoretical basis for HRC, and identifying categories of ecosystem value that are not measured by any other techniques.

Dr. Stavins finds HRC to be even more objectionable than other aspects of the EBA, describing it as "completely illegitimate" and "fatally flawed." Yet again, we have only his word to go on, with little in the way of documentation. My reading of the literature is quite different; it appears to me that standard texts on environmental economics are *not* filled with warnings against the dire perils of the avoided cost method of benefits estimation.

Indeed, valuation of assets at replacement cost is a common practice in economics. In macroeconomics, depreciation is routinely valued at replacement cost; the difference between historical book value and market value (market value *is* current replacement cost, for a marketed asset) is essential in understanding investments. Any detailed analysis of capital costs

focuses on "economic depreciation", or the replacement cost of the capital that is consumed, and distinguishes it from accounting measures of depreciation based on book value or tax laws.[12]

Insurance companies frequently value damages to property at estimated replacement cost. If any of us should experience a loss, our home insurance provider might pay us on the basis of "household replacement cost" — unless we have explained to them that the calculation is fatally flawed and insisted on using a much lower value, as Dr. Stavins proposes to do for ecosystems.

Another important disagreement lurks behind these comments. Are the natural resources that are affected by cooling water intake best thought of as long-lived capital goods — or are they more like consumer goods that people, or power plants, might choose to consume when they are hungry? If you eat the last cookie and then throw out the box, you may not have to pay the full "cookie replacement cost." Perhaps you are getting tired of cookies and don't plan to buy any more, so there is no need to worry about replacement cost. Something along these lines seems to be involved in the claim that HRC overstates the value of environmental resources: if we are planning to consume the ecosystem without replacement, then HRC might overestimate the values at stake.

---

[12] There are numerous examples, such as Frank C. Wykoff, "Economic Depreciation and the User Cost of Business-Leased Automobiles," and other essays in Dale W. Jorgenson and Ralph Landau, editors, *Technology and Capital Formation* (MIT Press, 1989).

A cookie box is not an appropriate analogy for the environmental resources protected by the Clean Water Act. Rather, the aquatic ecosystems under discussion in this case are long-lived assets, comparable to capital goods, which provide a wide range of valuable services. Society values and plans to keep these assets for the long run, and expects to receive their services year after year. The view of nature as "natural capital" is one of the foundations of ecological economics; but more conventional environmental economists have also argued that natural resources should be analyzed as assets, i.e. comparable to capital rather than consumer goods.[13]

HRC often looks more expensive than conventional approaches to valuation, as Dr. Stavins emphasizes. But this may simply reflect the incompleteness of conventional valuation, as discussed in section 2 above. Ecosystems provide numerous services simultaneously, using the same "capital equipment" to produce multiple benefits. Many of these benefits are not normally evaluated, but should be. As the list of separately evaluated benefits grows longer, the total benefit will of course increase. If we were able to achieve complete evaluation of ecosystem benefits, assuming that each benefit had to be produced and evaluated separately, we might well find that the totals exceeded HRC estimates. Nature has evolved efficient and parsimonious ways of producing many ecosystem

---

[13] "Examples abound in the scientific literature supporting the asset interpretation of environmental resources." V. Kerry Smith, *Estimating Economic Values for Nature: Methods for Non-Market Valuation* (Edward Elgar, 1996), p.7. See also Smith's subsequent discussion of the "asset interpretation."

services from limited resources; it would be surprising if artificial substitutes were routinely cheaper.

Although HRC is the only valuation method that even comes close to capturing the full range of ecosystem services, it, too, has shortcomings. In practical terms, it appears difficult and expensive to perform adequate HRC calculations; even more than with other valuation techniques, time and budget constraints may often limit the applications of HRC. Speaking more theoretically, HRC may at times be inappropriate because some ecosystems and natural services are not replaceable. If environmental damages involve risks of extinction of species, destruction of unique resources, or even disruption that allows unwanted invasive species to occupy vacated ecological niches, there may be no way to undo what has been done. Calculation of habitat replacement costs for regulatory purposes have often involved cost estimates for generic wetland restoration, an approach that captures only some of the ecosystem services that are at risk.

Despite these limitations, HRC remains a valuable contribution to the process of valuation whenever it can be used. I recommend that EPA explore HRC valuation of additional sites, to broaden the data and analysis used in the estimates of benefits in this case.

6. Problems of social choice and the use of societal revealed preference

To value the effects of cooling water intake on threatened and endangered species, EPA employs an innovative method described as "societal revealed preference" in the case study of the San Francisco Bay estuary plants. Essentially, the method assigns values

based on the amounts that society has been willing to pay for protection of similar threatened and endangered species in other contexts. Economists have frequently deduced individual "revealed preference" for environmental amenities from individual behavior in other markets; here EPA simply extends the same reasoning to social behavior and social choices. Dr. Stavins again displays his hostility to theoretical innovation, describing this procedure as having "no foundation whatsoever in economic theory"; it is in his view "totally invalid... a complete corruption of the notion of a *revealed-preference* method... a complete sham..."

The revealed preference procedure employed by EPA would be entirely orthodox and familiar, even qualifying for endorsement by Dr. Stavins and the *Guidelines for Preparing Economic Analyses*, if it referred to individual rather than social choice. Thus the question at issue can be restated: is it totally invalid and a complete sham to consider issues of social choice, separately from individual choice? Both economic theory and political reality show that there is an irreducible, independent role for social choice.

In economic theory, Kenneth Arrow's impossibility theorem proved long ago that there is no universal "social welfare function" — that is, no mathematical function of individual choices always produces meaningful social choices.[14] Questions of public goods and public choice continue to challenge the standard

---

[14] More precisely speaking, Arrow proved that there is in general no social welfare function that depends solely on individual preferences for relevant alternatives and avoids intransitivity, unless it is dictatorial (always agreeing with one individual no matter what others prefer).

model of individual choice; as textbooks often point out, there is no such thing as an individual demand curve for national defense. (Nor are there cost-benefit analyses to determine how much defense spending is "efficient" based on individual revealed preferences.) Any attempt to convert defense spending to a matter of individual purchases or private willingness to pay would be overwhelmed by the "free rider" problem: why pay for your individual share of defense, since your neighbors' contributions will defend you as much as them?

Exactly analogous questions arise in environmental economics. Nobel laureate Amartya Sen, in recent comments on cost-benefit analysis, points out that individual willingness to pay for major environmental initiatives is not always meaningful: if the amount you would contribute to cleaning up an Exxon Valdez-sized oil spill does not depend on whether anyone else contributes anything, then you have not understood the nature of the problem. On the other hand, if the question is how much would you contribute if everyone else contributes the same amount, we are no longer discussing *individual* willingness to pay. As Sen puts it:

> The very idea that I treat the prevention of an environmental damage just like buying a private good is itself quite absurd. The amount I am ready to pay for my toothpaste is typically not affected by the amount you pay for yours. But it would be amazing if the payment I am ready to make to save nature is totally independent of what others are ready to

> pay for it, since it is specifically a social concern.[15]

Dr. Stavins drifts out of economic theory and into political debate when he argues against societal revealed preference on the grounds that preferences must be "revealed by those individuals who are doing the paying, *not* by the judgment of others (in this case, legislatures, executive departments and agencies, and/or courts)." (Stavins comments, p. 27) Denouncing the supposed arbitrariness and unrepresentativeness of all government actions has become unfortunately fashionable; but in this case it is necessary to look beyond the rhetoric. Who exactly is paying for the actions of legislatures, executive agencies, and courts? Ultimately, the answer can only be the taxpayers, ratepayers (consumers), and shareholders — that is, society.

Do people feel that the decisions about environmental protection, made on their behalf by their elected representatives, are hopelessly inefficient and expensive? Is there a groundswell of popular demand to save money by eliminating the Clean Air Act, the Clean Water Act, protection for endangered species, and all the rest? Of course not. On the contrary, many successful politicians have figured out that people strongly prefer environmental protection, and are willing to have their money spent to back up that preference. That's how democracy is supposed to work, with or without the blessing of conventional economic doctrine. Social choice is alive and well in

---

[15] Amartya Sen, "The Discipline of Cost-Benefit Analysis," *Journal of Legal Studies* 29 no. 2 part 2 (June 2000), pp. 931-952; quote from 949.

environmental policy, and cannot always be deduced from isolated individual behavior. Dr. Stavins is able to "prove" that individual preferences are necessarily more legitimate than social preferences only by assuming that answer to begin with.

There is one more piece to the case against inferring social values from past regulation, as seen in the "societal revealed preference" approach; this final argument is implicit rather than explicit in Dr. Stavins' comments. It is often said that past regulations, adopted without the benefit of careful economic analysis, have been disastrously expensive. Long lists of regulations, purporting to show wildly differing costs per life saved, are frequently cited as evidence of the need for cost-benefit analysis, rather than reliance on regulatory precedent. The lists, however, can almost always be traced back to just two original studies of the costs of regulation. Careful reading of those original studies reveals that they are routinely misquoted: they are studies of the costs of actual *and proposed* regulations, or in one case, actual, proposed, *and other possible* regulations that have never even been proposed by any agency.[16] The ridiculously expensive regulations described in these studies are almost entirely the ones that were never adopted. In many cases, EPA and other agencies rejected the expensive proposed regulations, precisely because they were too expensive — evidence of the success, not failure, of past regulatory practice.

---

[16] Lisa Heinzerling, "Regulatory Costs of Mythic Proportions," *Yale Law Journal* 107 no. 7 (May 1998), pp. 1981-2070; Lisa Heinzerling and Frank Ackerman, "The Humbugs of the Anti-Regulatory Movement," *Cornell Law Review* 87 no. 2 (January 2002), pp. 648-670.

Since social choice cannot be reduced to individual choices, and past regulations are not nearly as expensive as is commonly believed, EPA's "societal revealed preference" method is a promising new innovation in the methods of valuation, one that deserves further development and discussion.

7. Limitations of cost-benefit analysis and merits of the "best available technology" standard

To summarize briefly, I have demonstrated that EPA's analysis of the benefits of reducing cooling water intake is incomplete, and underestimates true, complete benefits by an unknown but large amount. Just two corrections — accounting for the large "non-landed fraction" of I&E mortality of valuable species and increasing non-use values to levels more in line with the recent economics literature — add billions of dollars to the benefits of each regulatory option. These adjustments show that EPA's proposed option does not maximize net social benefits. Dr. Stavins is not persuasive in his arguments for banning innovation in economics and lowering benefit estimates throughout the analysis. Two of the innovations adopted by EPA in this case, habitat-based replacement cost (HRC) and societal revealed preference, are useful contributions to the fast-changing field of environmental economics, and deserve to be analyzed in depth and applied more widely.

It is clear that there is no consensus on these issues. One of the few things that Dr. Stavins and I agree on is that EPA's published benefit estimates are an insufficient basis on which to make a decision in this case. The plain truth of the matter is that cost-benefit analysis has failed in its fundamental political ambition.

Rather than providing an objective, transparent standard for cost-effective decision-making, cost-benefit analysis has become a partisan battleground where opposing parties fight over rival technical hypotheses about environmental valuation.

Fortunately, cost-benefit analysis is not required in this case. There is no reason to base the regulation of cooling water intake on an analysis that is neither required by law, nor close to complete representation of benefits, nor successful in achieving objectivity and transparency. My Scenario C (refer to Tables 1 and 2 above), combining my two revised estimates, makes it clear that every policy option under consideration has substantial net social benefits. Any choice of the "best available technology" from among these options will bring social benefits greater than its costs; options that achieve the greatest reduction in cooling water intake generally appear to have the greatest benefits.

In the end, only one question of "willingness to pay" matters for the politics of regulatory policy. It is a much broader, less technical question than the ones raised in the EBA. Any regulation will impose some costs; power plant operators will undoubtedly pass those costs on to their customers. So the question that ultimately matters is, are ratepayers willing to pay the increased costs imposed by regulation?[17] As Synapse

---

[17] One could also examine the impact on the plant owners. EPA did in fact discuss comparison of the costs of the rule to the revenues of the affected companies. But Dr. Stavins, commenting on behalf of PG&E [TRACKED EDIT: "PG&E" replaced previous text: "the corporate owner of Brayton Point"], says, "The comparison [of regulatory costs to company revenues] is utterly irrelevant!... Although such a socially efficient technology [one endorsed by Dr. Stavins' analysis] maximizes net benefits to

Energy Economics has estimated in their comments on this rule, if all costs were passed on to the consumer, an all cooling tower rule would cost each ratepayer 28 cents per month on their electric bills. If the public was asked, "Are you willing to pay 28 cents more per month on your electric bill to avoid massive fish mortality and other underwater environmental damages caused by power plants?", I feel confident the answer would be "yes." And if people are willing to pay the costs of environmental protection, there is no way for experts to prove that they are wrong.

Sincerely,

Frank Ackerman

---

society, it may yield higher costs than benefits to an affected company." (Stavins comments, pp. 11, 12)

State Water Resources Control Board

[graphic omitted]
Vinston H. Hickox
Secretary for Environmental Protection

[graphic omitted]
Gray Davis
Governor

Executive Office
1001 I Street • Sacramento, California 95814 • (916) 341-5615
Mailing Address: P.O. Box 100 Street • Sacramento, California • 95812-0100
FAX (916) 341-521 • Web Site Address: http://www.swrcb.ca.gov

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption.

For a list of simple ways you can reduce demand and cut your energy costs, see our Web-site at: http://www.swrcb.ca.gov

[AUG 5 2002[[AUG 6 2002]

Proposed Rule Comment Clerk-W-00-32
U.S. Environmental Protection Agency
Cooling Water Intake Structure (Existing Facilities: Phase II)
Water Docket, Mail Code 4101
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, DC 20460

COMMENTS ON NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PROPOSED REGULATIONS TO ESTABLISH REQUIREMENTS FOR COOLING WATER INTAKE STRUCTURES AT PHASE II EXISTING FACILITIES (PROPOSED RULE)

Thank you for the opportunity to comment on the Proposed Rule for cooling water intake structures at existing Phase II facilities that was published in the Federal Register on April 9, 2002. I am submitting these comments on behalf of the State Water Resources Control Board (SWRCB) and its nine Regional Water Quality Control Boards (Regional Boards). These agencies have been delegated the authority to implement the National Pollutant Discharge Elimination System (NPDES) program in California. Comments on the Notice of Data Availability for Phase I were submitted on August 24, 2001.

Background

The Proposed Rule would affect 19 existing power plants in California. These power plants are listed in the Enclosure. Of these 19 facilities, nine draw water from the Pacific Ocean. The others draw water from bays, harbors, deltas, and estuaries. Environmental factors have affected the aquatic populations in these water bodies. These factors include pollution, reduction of freshwater inflows, loss of wetland habitat, invasive species, overfishing, thermal discharges and water intakes.

California recently deregulated its electrical utilities and required its privately owned utilities to sell their power plants to other companies. The purpose of this was to separate the delivery of power from the generation of power. The privately owned utilities complied with this requirement and sold their power plants, except for two nuclear power plants, the San Onofre Nuclear Generating Station and the Diablo Canyon Nuclear Power Plant. The new owners have been modernizing the power plants by adding new combined cycle units or replacing existing simple cycle units with combined cycle units. Projects of this type have been completed at Huntington Beach, are under construction at Moss Landing, have been approved at Contra Costa, and are under review at Potrero, Morro Bay, and El Segundo. The modernization will most likely continue until all the old single cycle units, except for the nuclear units, are replaced.

The modernization projects are being reviewed by the California Energy, Conservation and Development Commission (California Energy Commission) and the Regional Boards. To complete these reviews, the agencies have required biological studies to be completed to evaluate the impacts of the cooling water intake structures. These projects have been controversial. For various reasons, including the effects of the cooling water intakes, the public has expressed concerns about the continued use of the sites for power generation.

Federal Clean Water Act (CWA) section 316(b) studies were completed for California's power plants in the early 1980s. In some cases, the Regional Boards have required that these studies be revised. If the new

studies showed that modifications of the intake structures would be effective in reducing impingement and entrainment, the Regional Boards mandated the modifications.

Our experience is that existing technologies for once-through cooling water systems are good at preventing impingement but are poor at preventing entrainment, the effect of which is a challenge to model since the effect concerns impacts on complex biological systems. A parameter that the Central Coast Regional Board has been using for analyzing the effect is the proportional loss of larval productivity caused by entrainment. The proportional loss is determined by comparing the number of larvae entrained to the number of larvae in the source water. The method assumes that larval mortality through the cooling water system is 100 percent and that ecological systems do not compensate for the loss in productivity in a positive way. If this method is used, a once-through cooling water system located in a small bay or harbor will be shown to have a greater impact than a system located in an ocean. Exceptions for ocean intakes may occur when the intake is located in a small cove or an area of highly productive habitat.

California has an environmental review law called the California Environmental Quality Act (CEQA) that requires environmental review for projects, such as power plant modifications. In general, CEQA requires that for each significant impact identified in an environmental impact report (EIR), the EIR must discuss feasible measures to avoid or substantially reduce the project's significant environmental effect. CEQA gives public agencies in California the authority

to require feasible changes in any or all activities involved in a project to substantially lessen or avoid significant effects on the environment. This authority, however, is not unlimited, and there must be a clear nexus between the impact and the proposed mitigation. Under CEQA, the California Energy Commission is the lead agency for review of power plant modifications and has its own environmental review process.

California brought new power plants on line last year, and, at this time, it has enough power generation capacity to meet its energy needs. (These new plants do not have water intakes.) It does not, however, have a surplus of power generation capacity, and some power plants recently approved for construction are not initiating construction because of uncertainty in California's energy markets. Hence, any rule that requires an extended down time for plant modifications in the near future could create energy supply problems in California.

Comments on Proposed Rule

Definition of Existing Phase 11 Facilities

Under the definition in the Proposed Rule, additional units or units that replace existing units would be classified as existing facilities. Although site constraints may prevent the installation of recirculating cooling water towers on these new units, for other upgrades the cost of constructing a recirculating cooling water tower may be equivalent to the cost of constructing a recirculating cooling water tower at a new facility. USEPA should consider this in developing its standards. The issue is whether existing

facilities should always be "grandfathered" into the lower standard of the existing facility rule or whether they should be placed into the higher standard of the new facility rule as existing units are replaced.

Performance Standards

The proposed rule lists performance standards that a power plant must meet. For a power plant that generates more than 15 percent of its maximum capacity, the standards are:

- An 80 to 95 percent reduction in impingement from what would occur if the power plant had no facilities to reduce impingement (i.e., an onshore intake with a trash rack) and

- A 60 to 90 percent reduction in entrainment from what would occur if the power plant had no facilities to reduce entrainment.

The Proposed Rule is unclear as to how to measure the required reduction in impingement and entrainment. Do you measure the reduction by counting the organisms impinged and entrained? Do you weigh the organisms impinged and entrained? If so, do you use dry weight or wet weight? Do you have to measure the reduction for each life stage, or do you lump all life stages together and use a combined count or weight?

The technologies available to meet the required reduction in entrainment are unproven. Table 5-1 in the development document shows three technologies that can meet a 60 to 90 percent reduction in entrainment. These are the Gunderboom aquatic filter barrier, fine mesh travelling screen, and fine mesh

wedgewire screen. The Gunderboom aquatic filter barrier has only been used at one facility; it may be susceptible to biofouling; and it may not work in conditions of heavy currents or wave action. Fine mesh travelling screens have had limited seasonal applications and require frequent maintenance, especially in marine environments.

Wedgewire screens are more suitable for closed-cycle make-up intakes because the large size of the screens limits their applicability.

Because of the uncertainty of the available entrainment reduction technologies, applicants will most likely decide not to install them and instead will request site-specific determinations or will propose restoration measures as an alternative to meeting the performance standards. Otherwise, the owners would risk violating their NPDES permits and being subject to fines and requirements to modify or replace their entrainment reduction facilities.

In situations where once-through cooling is being allowed, SWRCB supports a process in which the applicant is required to evaluate alternative technologies for impingement and entrainment reduction and to select the most effective available technology for the site. This selection would be subject to approval from the permitting authority.

Site Specific Determinations

As an alternative to meeting the performance standards, the Proposed Rule allows a site-specific determination to be made when:

- The cost to comply with the performance standards would be significantly greater than the costs considered by USEPA when developing the performance standards; or

- The costs to comply with the performance standards would be significantly greater than the benefits.

Our experience is that it is difficult to obtain agreement on costs or benefits. The result is a long series of arguments involving dueling cost/benefit analyses. Cost estimates vary widely between estimates generated by the applicant and those generated by independent consultants. Estimates of biological impacts are even more variable, and the applicant often asserts that there will be no net impact. Even if agreement could be obtained on the benefits to a biological community of meeting the performance standards, agreeing on the monetary value on this benefit would still be difficult. If USEPA decides to adopt this portion of the Proposed Rule, we request that the Proposed Rule require the applicant to fund an independent analysis. We also request that "wholly disproportionate" be substituted for "significantly greater" to ensure that site-specific determinations will only be used in unusual circumstances. A rule that requires cost/benefit analyses for most decisions will be difficult to administer.

Restoration Measures

In lieu of or in combination with impingement and entrainment reduction technologies the Proposed Rule allows the use of restoration measures as an

alternative to meeting the performance standards. Under the Proposed Rule, the applicant must demonstrate that the restoration measures will maintain fish and shellfish within the water body, including the community structure and function, to a level comparable to those that will result if the performance measures were met.

Although restoration efforts may create a net benefit, it may be unrealistic to expect the restoration effort to restore the original structures to the aquatic community. A cooling water intake structure will affect each aquatic species differently. Therefore, it may be difficult to demonstrate that the original community structure and function is being maintained.

In cases where the cost of complying with the best technology available requirements would be wholly out of proportion to the benefits, it may be preferable to use a less effective technology combined with restoration measures. The emphasis of the Proposed Rule, however, should be the installation of facilities to minimize impingement and entrainment.

Application Requirements

The Proposed Rule requires the applicant to complete a comprehensive demonstration study at least 180 days before the existing permit expires. As proposed, the comprehensive demonstration study must include:

- A proposal for information collection;
- Source water flow information;

- An impingement and entrainment characterization study;
- A design and construction technology plan;
- Information to support proposed restoration measures;
- Information to support a site-specific determination of best technology available for minimizing adverse environmental impact; and
- A verification monitoring plan.

The proposal for information collection should be submitted at least two years before the submittal of the other portions of the comprehensive demonstration study to allow time to review the proposal and complete necessary monitoring.

For the design and construction technology plan, it is not clear as to how to calculate the baseline rate of impingement and entrainment. Rates for impingement and entrainment are site specific, and the only way to accurately characterize them would be to dismantle the existing technology and to measure the subsequent rate of impingement and entrainment. Since the baseline rates will later be used for the purpose of determining compliance, both applicants and regulatory agencies will probably not find estimated rates based on other sites to be acceptable.

Monitoring Requirements

We have no comments for this section.

Record Keeping Requirements

We have no comments for this section.

Requirements for the Director

We have no comments for this section.

Again, thank you for the opportunity to comment. If you have any questions concerning the comments, please call Stan Martinson, Chief of the Division of Water Quality, SWRCB, at (916) 341-5458 or Gordon Innes, Division of Water Quality, SWRCB, at (916) 341-5517.

Sincerely,

/s/ [illegible] for

Celeste Cantú
Executive Director

Enclosure

CC: Mr. Joe O'Hagan
California Energy Conservation
and Development Commission
1516 Ninth Street
Sacramento, CA 95814

Atlantic States Marine Fisheries Commission
1444 Eye Street, N.W., Sixth Floor
Washington, D.C. 20005
(202) 289-6400 (phone) (202) 289-6051 (fax)
www.asmfc.org

Susan Shipman (GA)
Chair

John V. O'Shea
Executive Director

John I. Nelson (NH)
Vice-Chair

August 7, 2002

Cooling Water Intake Structure (Existing Facilities: Phase II)
Proposed Rule Comment Clerk, W-00-32, Water Docket
Mail Code 4104
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue N.W.
Washington D.C. 20460

Dear Environmental Protection Agency:

The Atlantic States Marine Fisheries Commission appreciates the opportunity to provide comments on the proposed Environmental Protection Agency Section 316(b) regulations under the Clean Water Act. The fifteen Atlantic Coastal States working cooperatively through the Commission collectively manage many of the coastal fishery resources in state waters along the Atlantic coast. Many of these species, including striped bass, sturgeon, shad, river herring, weakfish and flounder have anadromous or estuarine life cycles that rely heavily on rivers and estuaries

along the Atlantic Coast for spawning and nursery areas. Impingement and entrainment of eggs, larvae and juveniles from cooling water intake structures is potentially of great importance to these species and, thus, to the Commission.

The Commission strongly supports the EPA's decision to establish consistent national standards that outline minimum requirements of location, flow, and velocity for existing facilities. This will remove the uncertainty in the existing case-by-case basis approach while still allowing the state permitting authorities to provide additional site-specific measures when the resource requires them. The Commission also supports the EPA's decision to provide greater protection for water bodies with greater biological productivity.

Although the Commission supports the overall approach to these proposed regulations, we have some significant concerns. The EPA has proposed three options for establishing the best technology available for minimizing adverse environmental impacts in the proposed rule. The ASMFC supports the first two but opposes the third option of the facility owner demonstrating that the cost of compliance would be significantly greater than the EPA estimate or value of the benefits. We do not believe that there is enough data available on all of the fish species to fully estimate the cost of impingement and entrainment at each individual facility, nor do we believe that the methods currently proposed fully estimate the value of the key commercial and recreational fisheries or their forage base. In addition, we believe that the EPA has already removed what they believe to be economically infeasible options by choosing not to require dry condenser cooling technology. Currently, most of the

state permitting agencies do not have the appropriate staff to properly evaluate these proposals, and it would increase the permitting work loads and timeframes substantially to necessitate the review of comprehensive cost-benefit analyses. If the EPA does choose to go forward allowing this option the ASMFC urges you to require costs to be "wholly disproportionate" to the costs EPA has considered as you did with the new facilities rule rather that "significantly greater" as has been proposed for this rule.

We also have concerns with allowing restoration measures by a facility in lieu of reductions in impingement mortality and entrainment. While many of the restoration efforts taking place along the Atlantic Coast are beneficial to the species we manage, restoration should not be used in place of technology to reduce impacts. Restoration should only be used when these impacts cannot be avoided or have already occurred. Restoration science is not currently able to recreate the full functional equivalency (the full range, sequence and timing of interdependent life cycle stages that make up a productive, functioning, aquatic community) destroyed through impingement and entrainment. If the EPA does choose to go forward with allowing restoration in lieu of reductions, the ASMFC urges you to require restoration efforts in the same local waterbody where impacts are occurring. In addition facilities should be required to demonstrate that their restoration efforts would achieve a high level of functional equivalency before it is considered as an alternative to reductions in impingement and entrainment.

Thank you for your careful and close attention to the needs of our managed species. Please contact Carrie Selberg, the Habitat Specialist on my staff, if you have any questions.

Sincerely,

/s/ Carrie Selberg / for

John V. O'Shea

[Florida Dept. Industrial Wastewater]

To: Cooling Water Intake Structure (Existing Facilities; Phase II)
Proposed Rule Comment Clerk—W-00-032,
Water Docket,
Room EB57
401 M Street, SW
Washington DC 20460

Electronically Submitted to: ow-docket@epa.gov

Date: August 7, 2002

Subject: Comments on National Pollutant Discharge Elimination System—Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II existing Facilities, Proposed Rule; Published Tuesday, April 9, 2002, Federal Register Volume 67, Number 68

Thank you for the opportunity to comment on the referenced Proposed Rule. We support the Environmental Protection Agency's (EPA) efforts to address the water quality impacts of cooling water intake structures, and recognize the difficulty of developing such a comprehensive rule. The following comments focus on permitting procedural issues and endangered species concerns.

PROCEDURAL PERMITTING ISSUES

The Proposed Rule 40 CFR Part 125.92, Subpart J "When must I comply with this subpart?" states, "You must comply with this subpart when an NPDES

permit containing requirements consistent with this subpart is issued to you."

The language in this subparagraph does not clearly indicate when the Permittee must comply and when the Permitting Authority must require compliance with the rule for the specific regulated community, which consists of existing facilities. The majority of these facilities have held NPDES permits for many years. They are mostly Once-Through Cooling Water (OTCW) systems, and therefore are mostly older facilities. Thus, the overwhelming majority of the NPDES permits in question will be renewals. Does EPA intend that compliance with the rule must be achieved when the next renewal permit is issued following the effective date of the final Phase II rule?

We are concerned that this rule language may lead to inconsistent implementation among the delegated states and EPA Regions, as permit writers and Permittees struggle to understand the intent of the rule. A number of situations which can realistically occur would make the permitting process confusing and uncertain. What if a renewal application is received before the effective date of the final rule, but a permit is not issued by the effective date? What if a Draft Permit is issued just before the effective date, but not a Proposed Permit? What about a Proposed Permit just before the effective date but not a Final Permit? Such cases boil down to a general concern: Permittees need sufficient time to adequately evaluate and implement the means by which they will comply with the rule, and Permit Writers need sufficient guidance from the rule to determine when compliance must be achieved. Each of these cases obviously has the potential to create a situation in which the Permittee (who may have been

operating in good faith and in compliance for many years) can be set at odds with the State and with EPA, potentially delaying renewal and compliance to the detriment of the environment.

Several mechanisms, perhaps in combination, could reduce this sort of implementation crisis. EPA could revise the proposed rule clarifying that facilities which apply for renewal or for their initial permit before the effective date of the Final rule will not be subject to the rule until a specified subsequent date or the next renewal. EPA could revise the proposed rule incorporating a fixed period of time over which facilities can evaluate how they will meet the performance standards or develop site-specific performance standards. Alternatively, a compliance schedule could be incorporated into permits allowing the permittee enough time to come into compliance. In any event, clarification should provide a framework of consistency to guide both Permittees and Permit Writers nationwide.

ENDANGERED SPECIES ISSUES

The Proposed Draft Rule seeks to protect endangered aquatic species by reducing losses due to impingement and entrainment from cooling water intake structures (CWIS) regulated under Phase II. To the extent that this beneficial effect will result from limitations on warm water discharges at once-through cooling water systems, serious harm may result for the Florida manatee, a very important endangered aquatic species in our State's waters. Unlike many other aquatic species, manatees are not impacted by impingement or entrainment from CWIS. On the contrary, manatees find refuge in the warm water discharge areas of some

of Florida's steam electric power plants during cold days in the winter. It is estimated that two-thirds of the Florida manatee population uses these man-made warm water refuges on the coldest days. The situation presents a difficult case study in competing environmental benefits and impacts.

Within the proposed rule, as currently written, we do not find a mechanism for the protection of species that may be adversely impacted by the significant reductions in warm water discharges that will result from implementation of the proposed rule. It is easy to understand how this oversight could have occurred, given the rule's mandated focus on intake structures rather than discharge, the magnitude of EPA's task, and the fact that manatees are uniquely Floridian and Caribbean animals living nowhere else in the United States. Nevertheless, we believe that the proposed rule should be revised to incorporate the flexibility to protect the endangered Florida manatee.

Thank you again for your consideration of our comments.

Allen Hubbard, P.E., Supervisor
Steam Electric Power Plant NPDES Permitting
[Florida Dept. Industrial Wastewater]

cc: Richard Drew
Elsa Potts
Geofrey Mansfield
Steven Wolfe
Jennifer Fitzwater

New York State Department of Environmental Conservation Office of Natural Resources
625 Broadway, Albany, New York 12233-1010
Phone: (518) 402-8560 • **FAX:** (518) 402-9016
Website: www.dec.state.ny.us

[Graphic omitted]
Erin M. Crotty
Commissioner

Cooling Water Intake Structure
Existing Facilities Phase II
Proposed Rule Comment Clerk-W-00-32
Water Docket, Mail Code 4101
EPA Ariel Rios Bldg.
1200 Pennsylvania Ave., NW
Washington, DC 20460

RE: W-00-32 - NYS DEC comments regarding the NPDES Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities

Dear Madam or Sir:

The New York State Department of Environmental Conservation (NYSDEC) is the executive department of the State of New York having primary responsibility for administration, permitting, and enforcement of State environmental protection laws, including water pollution control and water utilization laws and laws regulating fish and wildlife resources. NYSDEC is the agency to which EPA has approved to administer State NPDES permits under the Clean Water Act. As such, our Commissioner or her designee serves as the state

"Director" in deciding the conditions and implementing regulations in our State Pollutant Discharge Elimination System (SPDES) Permits, and in implementing the proposed regulations regarding cooling water intake systems for which EPA is soliciting comments. Following are our Department's major comments on the proposed regulations. As you will see, we support some provisions of the proposed rule, oppose others, and offer suggestions. We have arranged our comments by topic.

1. General Statements of Support - We fully support many of the provisions of EPA's overall approach. Specifically:

a. We support the promulgation of nationally-applicable minimum standards. This ensures fair competition among generators and other facilities with cooling water intake structures both across and within states.

b. We support the provisions which afford the generator flexibility in selecting the technology or operational measures that reduce impingement mortality and entrainment.

c. We support the proposal for a theoretical baseline impact to be calculated as a shoreline intake with no impingement/entrainment controls. This would fairly credit existing facilities for the mitigative measures they implemented prior to the effective date of the proposed regulations.

d. We support these Phase II rules (with the changes recommended below) because, on a national basis, they affect 57 per cent of existing

power generating stations and 99.04 per cent of the total flow withdrawn by existing steam-electric power generating facilities.

e. We support and agree with EPA's recognition that the primary focus for Phase II performance standards for existing facilities is the goal of reducing specifically aquatic impacts, and fish mortality.

2. New York's Preferred Alternative - We prefer your "Impingement Mortality and Entrainment Controls Everywhere" (as presented on pages 17158-17159 in Section VI(B)(4)) alternative to EPA's Preferred Alternative. We strongly recommend that EPA adopt this alternative because it "levels the playing field" for all generating companies and because it offers flexibility. The generators would be fully aware of what is required to meet the performance requirements of proposed Section 125.94(b)(3). EPA would establish the required level of performance but generators would be free to select any or a combination of techniques to achieve the performance level. This is the simplest alternative to implement and your analysis found that it provides the highest benefit to cost ratio (3.74:1). An additional advantage is that companies and regulators could put their staff and monetary resources into reducing impacts instead of into studies and rebuttals. This alternative also responds to what EPA has asked comment on: the 'extreme burden' on State agencies which cost/benefit and site specific determinations have imposed, over these past years on state agencies. Finally, we agree with EPA's statement that "This alternative would establish clear performance-based requirements that

are simpler and easier to implement than those proposed and are based on the use of available technologies to reduce adverse environmental impact. Such an alternative would be consistent with the focus on use of best technology required under Section 316(b)."

3. EPA's Preferred Alternative - While parts of "EPA's Preferred Alternative" have very positive elements, we see a number of potentially serious problems. As proposed, a facility would select one of three different Methods to establish the best technology available (BTA) for minimizing adverse environmental impact:

Method 1. The facility owner demonstrates compliance with the new rules.

Method 2. The facility owner implements additional technologies, and operational or restoration measures.

Method 3. The facility owner demonstrates that the cost of compliance would be significantly greater than either the EPA estimate of costs, or the site-specific value of the benefits.

a. Our support for many of these provisions and our suggestions for improvement are as follows:

1. Method 1 is straightforward and we support it. Closed-cycle recirculating facilities would be deemed in compliance. For purposes of regulatory and scientific certainty, a demonstration of compliance

at other facilities should require at least one year of impingement and entrainment study in order to document compliance. We recommend that additional studies be conducted at least one year in each five year permit term (except for facilities equipped with closed cycle systems) to verify compliance.

2. We support the concept in Method 2 of reducing impacts by adding technology and measuring the results against the standard. We believe, though, that the sampling proposed is insufficient and would yield erroneous or incomplete results. We recommend that collections for impingement should be performed for a 24-hour period at lease once per week for 52 consecutive weeks. Collections for entrainment should be performed at intervals no greater than 6 hours apart over a 24-hour period at least once per week though periods when spawning occurs in the affected water body. Method 2 appears to require that, at a minimum, an impingement and entrainment monitoring program be conducted "before" and "after" mitigative measures have been implemented to determine levels of impact. We support the proposed components of a "Comprehensive Demonstration Study" to be conducted for existing facilities. Finally, as with Method 1, we suggest that facilities be required to reevaluate impingement and entrainment impacts

during one year of each five-year permit period.

3. We support the different thresholds of protection for different water bodies, as EPA has proposed, and the flexibility for a Director to select a level of protection within a finite range. We agree with the proposed target ranges of reducing impingement mortality by 80 to 95 per cent, and entrainment by 60 to 90 per cent; this approach recognizes that levels achievable from closed cycle cooling vary depending on the salinity of the waterbody.

b. Our concern is greatest with Method 3. We believe it could effectively negate the value of the entire Phase 11 rule; our thoughts are as follows:

1. Lowering the standard from "costs wholly disproportionate to benefits" to the much less stringent "costs significantly greater than site specific benefits" is unacceptably problematic. The former criterion has been applied to these Phase II and all other facilities since the 1970's and is supported by a substantial body of case law, permit decisions and legal opinions.

2. State fish and wildlife resources would be at risk if the lower standard were used; in New York, the aquatic organisms impacted by plant intakes belong to the State (Environmental Conservation Law

§11-0105). Rather than the widely-accepted "polluter pays" approach, the EPA-proposed rule weighs a polluter's cost against a monetized value of fish and wildlife resources it does not own and to which it has no entitlement.

3. The value or "benefit" of State fish and wildlife resources is difficult to quantify. Whereas the costs of mitigative measures are easy to quantify using familiar accounting techniques, the task of placing an accurate dollar value on aquatic resource impacts is rife with ecological and economic challenges; there is no widely-accepted methodology. In contrast, by maintaining the conventional "costs wholly disproportionate to benefits" analysis, generators would have to look at the incremental cost of controls in light of the dollars they make selling electricity.

4. Method 3 would generate numerous studies which could impose a substantial review burden on state agencies. As cited in your discussion, Salem Nuclear Generating Station's permit application comprised 36 volumes supported by 137 additional volumes of technical and reference materials. Clearly, a significant effort would be required to meaningfully scrutinize so much information. Furthermore, state water quality and natural resource agencies would frequently need to retain the specialized

expertise needed for review of the more arcane studies. Once again, EPA recognizes this extreme burden and we agree.

5. Method 3 appears to provide an unfair competitive advantage to old, inefficient, high impact facilities. In the competitive wholesale electric power market if a biased cost/benefit analysis would enable a facility avoid or reduce the costs needed to achieve standards, it could sell its electricity more cheaply than newer, more efficient, compliant facilities that have internalized the cost of impingement and entrainment protection. This market advantage could be a strong disincentive to comply under Method 1 or Method 2, and would penalize new power plants regulated under the Phase I rule. Such an outcome would not serve the purposes of the Clean Water Act, nor would it serve the interests of cleaner air and more efficient use of fossil fuels. Plants that cannot satisfy Method 1 or Method 2 should be: 1) repowered to modern technology; 2) decommissioned as having outlived their usefulness; or 3) operated at less than EPA's proposed 15 per cent capacity to qualify for that exemption.

6. We are also concerned about the provision in EPA's Preferred Alternative (described in Method 2, as well) that would allow for restoration in lieu of controls to avoid and minimize

impingement and entrainment impacts. We believe that restoration is appropriate only within the widely-used stepwise approach whereby every effort is made to first avoid and then minimize impacts through technology-based measures on intake design, location, construction, and capacity. Restoration should be used only to address truly unavoidable impacts.

7. "Restoration" includes habitat creation, habitat restoration, or stocking organisms. Any approved restoration plan should be designed to promote natural propagation and survival of indigenous species which have been impacted by plant operations. In addition, restoration should be viewed as a temporary measure to allow the facility to continue to operate until suitable in-plant solutions can be devised or the facility is decommissioned.

Stocking to replace organisms killed or injured should be avoided. First, the aquatic resource diversity is high. In the case of New York's Hudson River, for example, more than 100 species are at risk to power plant intakes. Also, artificial propagation is difficult. Our experience with a striped bass hatchery on the Hudson River is that it never reached its target level of production, and the target was still a small fraction of the striped bass killed by plant intakes.

Further confounding issues are genetics, disease, and intraspecific competition with naturally-spawned fish.

Finally, there are practical limitations to restoration, too. In many systems, the space and/or hydrology are unavailable for meaningful restoration. Creating another Hudson River or another Great Lake would be impracticable.

4. Site-Specific Alternative - We do not endorse "site-specific alternative" approaches as defined in the proposed rule, especially the one proposed by UWAG (the Utility Water Act Group). We believe it would cancel the benefit of having a national standard; it appears to offer less protection than the 1977 draft guidance in current use. The intensity of sampling and study necessary to detect a 1 per cent or 5 per cent population change with certainty, and to be able to attribute that impact to an individual plant, would be exceedingly costly and perhaps technically impossible in most instances.

We also disagree with the definition of "adverse environmental impact" as proposed by UWAG. We consider any impingement or entrainment to constitute an adverse environmental impact. Considering impacts only when they can be observed on a population level could allow irreversible damages to fish stocks. We do support the "Alternative Definition" as presented at (2) on Page 17163 because it considers numerous components of an aquatic community.

5. Dry Cooling - Although dry cooling may be the best technology at some facilities, we agree that retrofitting all existing plants with dry cooling should not be the standard because of 1) the massive cost and loss of efficiency in converting water-cooled plants to dry cooling, and 2) the other non-aquatic environmental impacts that dry cooling technology can impose.

6. Performance Level - We agree that the equivalent of "closed-cycle cooling everywhere" as defined in the proposed rule should not be the standard. The levels of performance are comparable to those we impose. The range of levels permits a wider variety of systems to be used, and would have a lesser impact on electric generation, especially in tidal rivers, estuaries, bays, and oceans.

7. Capacity Factor - We support EPA's proposed exemption for facilities with low capacity but have two reservations; we are concerned that the 15 per cent capacity (55 days per year) factor exemption threshold is too high. First, the time of year the plant is running could coincide with a peak impingement or entrainment period. For example, in New York City, peak capacity is usually needed during the summer; this is when bay anchovy, an important forage species, spawns. Data suggest that 55 days of operation in July or August could entrain very significant proportions of larval and juvenile anchovy populations.

We have a similar concern at facilities with multiple generating units. Since each unit can operate independently, there is a potential for significant impacts resulting from this exemption. A facility with several obsolete units that seldom run and one

efficient, newer unit that runs a high percentage of the time could qualify for this 15 per cent capacity factor exemption. As above, this circumstance would pose a problem if the high-use unit were operating during the peak impingement/entrainment season. In any case, the total capacity for a facility should only be based upon those units that have valid air emission permits and valid NPDES or SPDES permits.

8. Freshwater Rivers - We support EPA's proposal that on fresh water rivers, facilities that use 5 per cent or less of the mean annual flow would have to reduce impingement mortality, but not entrainment, and those using more than 5 per cent would have to reduce both. We feel that this criterion should not be any larger than 5 per cent for the exclusion from entrainment protection. On one New York river we examined, 5 per cent of mean annual flow equated to approximately 25 per cent of median August flow, with August being our average low-flow month. Thus, this level is still a substantial proportion of the river's flow in low flow months, and would be an even higher proportion in dry years. In such dry years a facility with coarse screens would entrain a greater percentage of small fish.

9. Mortality Credits - We have concerns about the concept of trading fish and wildlife mortality credits among facilities. First, we do not support trading mortality credits on a national basis. Such a system would appear to violate state sovereign rights over fish and wildlife resources and would compromise our capacity to manage these resources. Also, we do not support trading based on the biomass of the organisms killed. For example, the loss of a two-pound common

bullhead cannot be compared in any meaningful way to the loss of two pounds of endangered short-nosed sturgeon eggs or fry. In addition to the huge difference in the number of organisms per unit of weight, these species vary markedly with respect to survival rates, mean age of reproduction, narrowness of habitat requirements, abundance, and susceptibility to extirpation.

We would welcome an opportunity to discuss the proposed rules with you and regulatory agency representatives from other states prior to the promulgation of the final regulations. This would afford an opportunity to better explain or elaborate on these points. Also, in light of your willingness to provide ample opportunity for comment, we may be providing under separate cover supplemental comments and appendices that provide elaboration and substantiation on key points as well as responses to many of the "EPA requests comments on..." statements throughout the Proposed Phase II rule. If you have questions or a need to discuss this issue further, please contact Mr. Steven Jay Sanford, Chief, Bureau of Habitat at 518-402-8996, sxsanfor@gw.dec.state.ny.us. Thank you for the opportunity to comment and for your consideration of our views.

Sincerely,

/s/

Peter S. Duncan
Deputy Commissioner
Office of Natural Resources

cc: S. Sanford

Frank Ackerman, PhD and Rachel Massey, MPA, MSc[1]
Global Development and Environment Institute
Cabot Center
Tufts University
Medford, MA 02155

Cooling Water Intake Structure (Existing Facilities: Phase II)
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue N.W.
Washington D.C. 20460

Re: Comments on Notice of Data Availability, EPA 40 CFR Part 125
Clean Water Act §316(b) — National Pollutant Discharge Elimination System — Proposed Regulations for Cooling Water Intake Structures at Phase II Existing Facilities; Notice of Data Availability, March 19, 2003.

Dear Sir/Madam:

We are pleased to have the opportunity to submit comments on the above-captioned notice of data availability. As we discuss below, in our view cost-benefit analysis is an inappropriate tool for adjudicating the policy questions currently facing the Agency. However, even if one accepts cost-benefit analysis as an appropriate means to determine the

---

[1] Frank Ackerman is Research Director, and Rachel Massey is a Research Associate, at the Global Development and Environment Institute, Tufts University. These comments are not being submitted in an official capacity at Tufts University. They are being submitted on behalf of Riverkeeper.

appropriate level of regulation for power plant cooling water intake systems, the magnitude of the omissions in the NODA renders the exercise meaningless. The difficulties encountered in the attempt at monetization of benefits underscore the need for other approaches to evaluation of policy options.

As we discuss in detail below, despite the large amount of analysis that went into the NODA, the document includes only a fraction of the data that EPA itself considers to be relevant for the regulation. Having discarded the approach to nationwide calculations it used for the original proposed ruling, in the NODA the Agency presents benefit calculations for just two regions of the country. Calculation of both use and nonuse benefits is attempted for only one of the two regions; and even this calculation omits consideration of key biological facts.

The lack of key information in the NODA does not reflect lack of effort in gathering and analyzing data. Rather, the shortcomings of the NODA illustrate the flaws in the methodology that EPA is now pursuing. The task of quantifying benefits will require significant further analysis, and involves methodological quandaries that will not be resolved easily. In our opinion, by converting its regulatory mandate into a lengthy and methodologically questionable program of data collection and analysis, EPA has failed to meet its responsibilities under the Clean Water Act. The Agency has, however, developed a substantial body of data and background information. These data can be applied usefully to developing sound regulations, which should take account of benefits without holding them to the unrealistic standard of precise monetization, as the Agency has done thus far.

1. Background

EPA's original proposed rule calculated estimated costs and benefits for seven possible regulatory options: a waterbody/capacity-based option with two possible tracks; the proposed rule, with "alternative less stringent requirements based on both costs and benefits"; impingement mortality and entrainment controls everywhere; all cooling towers; a dry cooling option; and a waterbody-based option. According to EPA's analysis, net benefits were positive for four of the options examined; they were negative for the "all cooling towers" and "dry cooling" options, and were not costed for the "waterbody-based option." EPA's calculated net benefits were highest, by a small margin, for the "proposed option." For another option, which would have placed more stringent controls on cooling water intake systems, estimated net benefits were more than 99% of the estimated net benefits of the proposed option.[2]

In our comments on EPA's original draft ruling,[3] we presented a number of criticisms. We pointed out that EPA's estimation of net benefits was seriously flawed, and that even conservative adjustments to account for some of EPA's omissions would produce significantly higher benefit figures, and would imply that a different regulatory option had the highest net

---

[2] See 316(b) Phase II EBA, Part D: National Benefit-Cost Analysis, Chapter D1: Comparison of National Costs and Benefits. Available at http://www.epa.gov/waterscience/316b/econbenefits/d1.pdf, visited May 2003. Estimated net benefits for the proposed rule were $452 million, while estimated net benefits for the "Impingement Mortality and Entrainment Controls Everywhere" option were $449 million.

[3] Comments submitted by Frank Ackerman, August 1, 2002.

benefits. In particular, we noted that EPA's use of an outdated "rule of thumb" for calculating nonuse value was misleading, and lacking in theoretical or empirical justification.

We noted that EPA had effectively valued large portions of aquatic resources at zero. One striking omission was the failure to place any value on the unharvested fish that regenerate the population from year to year. We also expressed concern that EPA overlooked important sources of value, ranging from commercial value of shellfish through ecological, recreational, and nonuse value of aquatic flora, bird life, and other organisms. We found EPA's consideration of threatened and endangered species to be a worthwhile, but limited, first step toward an analysis of this topic. We supported EPA's efforts to develop "habitat replacement cost" (HRC) as a methodology for developing more complete and accurate benefits estimates, but cautioned that this methodology requires a level of biological information that is often unavailable.

2. What Changed in the NODA?

The NODA includes a number of adjustments in EPA's methodology. Some of these adjustments respond directly to our criticisms of the original analysis. However, additional methodological problems introduced in the NODA make it difficult to draw clear conclusions about whether EPA's analysis has, on balance, improved.

Important new elements that appear in the NODA include abandoning the outdated "rule of thumb" according to which nonuse benefits were formerly calculated as 50% of recreational use benefits;

acknowledging the nonzero value of unlanded fish; and grouping several previously distinct categories of value together in a new "nonuse" category. However, there are also methodological setbacks, where EPA retreats from desirable features of its earlier analysis. For instance, EPA abandons the "Habitat Replacement Cost" method of estimating total ecosystem value; gives little indication of how it expects to calculate use benefits in six of the eight regions or nonuse benefits in seven of the eight regions; and does not attempt any calculation of the value of threatened and endangered species lost to impingement and entrainment in the NODA.

Due to these and other limitations, it is difficult to evaluate the changes in EPA's methodology represented in the NODA. In the absence of a completed national benefits analysis, it is not clear how benefits will be calculated for each region and for the country as a whole. For example, is EPA planning to perform analyses for all eight regions, comparable to the NODA estimates for the North Atlantic? If not, what method of extrapolation will be used to scale regional estimates up to a national total? Within regions, what methods will be used to scale estimates for individual plants up to regional totals? The reclassification of power plants, from waterbody-based categories in the original analysis to regional groupings in the NODA, means that category totals from the two analyses cannot be directly compared.

Despite these difficulties, we have made an approximate comparison of the NODA to the Economic Benefits Analysis (EBA) performed by EPA last year, by looking at the three plants in the North Atlantic region, Brayton, Pilgrim, and Seabrook, that were

included in EPA's case studies for the EBA. We have compared the case study benefits for these three plants to the NODA benefits for the North Atlantic region as a whole, as shown in Table 1 (next page), using the average of high and low case benefit estimates throughout.

When benefits are expressed as dollars per cubic foot/second (cfs) of water flow, the North Atlantic regional benefits are now estimated at roughly $9,000 per cfs of flow. Since most of the region's plants (all but Pilgrim and Seabrook, in fact) are located on estuaries, the closest comparison may be to Brayton, the one North Atlantic estuary plant analyzed in the case studies. The benefit estimate for Brayton amounts to $10,350 per cfs, which is broadly comparable to the NODA value for the region as a whole. Thus we would guess, from the limited information available, that the NODA calculations introduce little change in aggregate estimated benefits. If this is the case, then the effort required to develop and implement the NODA methodology has little impact on the bottom line evaluation of policy options. While some problems in the analysis have been fixed from last year, other problems have been introduced. We showed last year that reasonable adjustments to the EBA methodology would produce much larger benefit estimates; we will demonstrate below that reasonable adjustments to the NODA methodology would likewise produce much larger benefit estimates for the North Atlantic, and thus presumably for the nation as a whole.

Table 1. Benefits/flow, North Atlantic region

	Average of high and low case benefits	Water flow (cubic ft/sec)	Benefits/ flow
NODA North Atlantic - no discounting	$111,140,000	11,897	$9,342
NODA North Atlantic - 3% discount rate	$110,660,000	11,897	$9,302
NODA North Atlantic - 7% discount rate	$110,230,000	11,897	$9,265
Case study - Brayton	$16,001,276	1,546	$10,350
Case study - Pilgrim	$9,786,000	691	$14,162
Case study - Seabrook	$344,602	896	$385

Water flow data from Pisces Conservation Ltd., from Form EIA-767.

Water flow data was not included for a few of the smaller plants in the NODA North Atlantic region.

3. NODA Benefits Analysis: Methodological Problems

In the NODA, EPA significantly revises the methodology it uses to calculate the expected benefits of the proposed ruling. However, the NODA includes only a fraction of the information that EPA itself considers to be relevant for the regulation. In our view, EPA has failed to develop a credible estimate of the benefits of the proposed regulation.

Our discussion of the NODA benefits analysis begins with issues of regional disaggregation and the role of meta-analysis. We then turn to the North Atlantic benefits estimates, where we focus on the missing categories of use value, the limited number of species included in the nonuse value analysis, and the geographical coverage of the nonuse value. Finally, we review some of the important categories of ecosystem value that are excluded from the NODA.

Among other points, we note that EPA's nonuse valuation of fish affected in the Peconic Bay estuary is highly incomplete; EPA inappropriately limits the geographic scope of its nonuse benefits analysis; and the NODA fails to consider key biological facts, including interdependence among species and precarious stock status for many populations. Minimal requirements for completing the analysis EPA has begun should include developing a use value for unharvested fish and completing the meta-analysis of existing studies on nonuse value. In addition, EPA must avoid placing an effective value of zero on categories of value the Agency does not have time or resources to analyze in detail.

Regional disaggregation and meta-analysis. In the NODA, EPA discards its previous system of categorizing power plants by water body type, and instead divides the country into eight regions. The level of detail provided for the North Atlantic region, and for the partial analysis of Northern California, together with the absence of any nationwide generalizations or extrapolations from this data, suggests that most data must be developed separately for each of the eight regions. However, EPA considers only two regions in the NODA: the North Atlantic region and the Northern California region. Furthermore, EPA attempts a full accounting of benefits for the North Atlantic region only; for the Northern California region, EPA has not yet looked at nonuse benefits.

One of the areas that required substantial, and creative, analytical effort in the NODA was the estimation of nonuse values for the North Atlantic region, a topic we discuss below. Unfortunately, the disaggregated NODA methodology suggests that a new analysis at this level of complexity needs to be done seven more times, once for each region. EPA's analysis suggests, though it never states explicitly, that nonuse values must be estimated on a locally specific basis. However, sufficient data may not be available for some regions; will nonuse values be declared to be zero for such regions? On a deeper level, the need for region-specific nonuse studies reflects the dubious assumption (discussed below) that nonuse values are only important in the immediate vicinity of the affected ecosystems. On the more reasonable assumption that nonuse values apply over much wider areas, it would be appropriate to develop a common

national methodology to supplement the regional approach.

One way to develop such a methodology is to conduct a meta-analysis of the numerous existing studies of nonuse values. Meta-analysis is a well-established research technique, used in many scientific and economic analyses to evaluate and combine the body of data and results contained in a range of similar studies; the expanded database allows researchers to develop greater confidence and precision in their results. EPA began, but did not complete, a meta-analysis of nonuse values of water resources for use in this case. We recommend that EPA complete that meta-analysis, and use it to support and contextualize national projections of nonuse value. The raw data provided by EPA, from its initial work on the meta-analysis, makes it clear that substantial nonuse values for water resources have been estimated, in several regions of the country.[4] In addition, studies in other contexts consistently support the view that Americans place a high nonuse value on natural resources. Annual willingness-to-pay values for highly visible animals such as bald eagles, humpback whales, and gray wolves add up into the tens of billions; the existence of a less famous endangered species, the striped shiner, is reportedly worth an average of $6 per household per year to the American public, or more than $600 million annually on a nationwide basis.[5] The clear lesson of

---

[4] Tudor, et al., "Comparison of Non-use and Use Values from Surface Water Valuation Studies," Memo to the 316(b) Record (DCN 5-1011), March 12, 2003, Appendix A.

[5] John B. Loomis and Douglas S. White, "Economic Benefits of Rare and Endangered Species: Summary and Meta-analysis",

these studies is that nonuse values are substantial; thus, for a benefits analysis to be complete, nonuse values must be estimated for all the affected organisms.

North Atlantic benefits – use values. For more detailed comments on the NODA benefit estimates, we now turn to the North Atlantic regional benefits, the only complete benefits analysis offered in the NODA. The benefits, as estimated in the NODA, consist of commercial use values, recreational use values, and nonuse values. While commercial and recreational benefits are of great importance, they are not the only use values that could and should be estimated.

Another category was omitted in both the earlier analysis and the NODA, namely the use value of the "unlanded" fraction of I&E losses. Estimates of commercial and recreational values are based only on the fraction of fish lost to I&E that would have been caught ("landed") in the absence of cooling water withdrawals. Normally only a small fraction of fish, even of the most valuable species, are caught by commercial and recreational fishing each year. In other words, most of the fish lost to I&E would have survived – and therefore are not included in estimates of either commercial or recreational value. The unlanded fish not only survive, but also reproduce, creating the fish that will be caught in future years. In effect, they are the natural capital of the fishing industry, analogous to the capital goods that are used in manufacturing.

Ecological Economics 18 (1996), 197-206; values from Table 1, p. 199.

The NODA recognizes that unlanded fish have a nonzero value (NODA, p. 13567), but focuses on their nonuse value; EPA does not propose a methodology for adequately estimating the use value of the unlanded fish. In our comments last year, we demonstrated that even a conservative estimate of the value of the unlanded fraction of I&E mortality has a large impact on total benefits.

Other important categories of value were also omitted, both in the EBA last year and in the NODA, as discussed on pp. 11-13 below.

North Atlantic benefits – species included in nonuse value. In the analysis for its Phase II proposal, EPA developed an estimate of nonuse value by using the outdated "50% rule." This rule arbitrarily sets nonuse value equal to half of the use value enjoyed by recreational users of a resource. As we have previously discussed,[6] in many cases nonuse value is likely to be significantly higher than this figure. Furthermore, it is misleading to develop a nonuse value estimate that refers solely to the recreational users of a resource, since many of the people who place a nonuse value on natural resources are not, in fact, recreational users.

In the NODA, EPA develops an estimate of nonuse value for commercially and recreationally harvested fish, as well as for forage fish and the unharvested portion of the harvestable population. This estimate is based on a willingness-to-pay (WTP) study of values placed on submerged aquatic vegetation (SAV) and wetlands in the Peconic Estuary. EPA's attempt to

---

[6] See Ackerman comments on the proposed rule, August 1, 2002.

develop nonuse value estimates on the basis of the Peconic Estuary WTP study is a significant improvement over the arbitrary application of the 50% rule, but still presents serious problems. In particular, SAV and wetlands can serve to regenerate some species of fish, but are inappropriate habitats for others. Thus, some species are not accounted for by a system in which SAV and wetlands are used as a proxy for fish abundance. Furthermore, data limitations forced EPA to base its analysis on a minority of the species that can regenerate in SAV or wetlands; other species might have greater requirements for SAV and wetlands.

EPA's analysis is based on I&E data collected at the Brayton Point and Pilgrim power plants. These data show levels of I&E losses for 37 fish species; apparently EPA did not consider non-fish aquatic organisms in this analysis. EPA attempted to estimate the amount of wetland and/or SAV habitat required to offset I&E losses of these fish species, "based on the amount of habitat necessary for a few species that could benefit from restoration of SAV and wetlands." Of the 37 fish species considered, "losses of seven species could be offset by tidal wetland restoration, and losses of six species could be offset by SAV restoration." EPA notes that these 13 species account for 45.7% of the total I&E losses in the North Atlantic Region.[7] The Agency apparently makes no attempt to calculate nonuse values for the other 24 affected

[7] DCN 5-1010: Tudor, et al., "Estimating Total and Non-Use Values for Fish, Based on Habitat Values for Coastal Wetlands and Eelgrass (SAV)," memo to the 316(b) record, March 12, 2003, p. 3.

species, accounting for more than half of the region's I&E losses.

Of the 13 fish species for which wetland and SAV restoration could be relevant, EPA was able to obtain sufficient information to proceed with the analysis for just six species: winter flounder, Atlantic silverside, and striped killifish as candidates for benefiting from wetland restoration, and threespine stickleback, northern pipefish, and scup for SAV restoration. EPA had no data on production rates in the relevant habitats even for these species, so the Agency estimated densities per acre based on abundance data. No abundance data were gathered for the remainder of the 13 species, which include some of the best-known and most valuable ones: American sand lance, grubby, striped bass, bluefish, Atlantic cod, weakfish, and pollock.[8]

In summary, in the attempt to generate data on the nonuse value of the fish lost to I&E in the North Atlantic region – losses that include at least 37 species – EPA estimated the relationship between acreage of two habitat types and likely density of just six fish species. EPA conducted no analysis whatsoever for the other affected species, even though well-known species such as striped bass, bluefish, and Atlantic cod are likely to have substantial nonuse values.

Having estimated area requirements for three species per habitat type (three for wetlands and three for SAV), EPA bases its final analysis on the species that, of each set of three, have the highest area requirements for regeneration. EPA expresses

---

[8] *Ibid.*, p.4.

concern that this overstates the acreage required for the other two species for which calculations (in the same habitat type) have been done. But the greater concern is the potential understatement of requirements: there is no way of knowing whether EPA's calculation accurately represents the requirements for regeneration of the seven other species for which wetlands and SAV are relevant; and it explicitly does not include the other 24 species identified in the region's I&E mortality data, ones that cannot be regenerated by these habitats. Nor, of course, does EPA's analysis attempt to measure the value of losses of nonfish species, such as shellfish or smaller, but nevertheless vital, components of the aquatic food web.

Given these large omissions, EPA should, at the very least, state what percentage of total nonuse value for the region it has analyzed and multiply its results by a corresponding factor. For example, does the nonuse value calculated for the Peconic Bay estuary represent an appropriate value for 6 out of 37 species, or about one-sixth of the species identified in I&E loss data? It may be difficult for the Agency to estimate what fraction of the affected fish it has accounted for in its analysis, but if the Agency fails to factor in those it has not accounted for, it has, once again, effectively placed a value of zero on many affected organisms.

North Atlantic benefits – geographical scope of nonuse benefits. EPA then converted estimates of required habitat areas into dollar values on the basis of a survey in which people were asked how much they value wetlands and SAV. The researchers did not tell respondents which fish the wetlands and SAV were expected to regenerate, so responses presumably

reflect respondents' general impressions about fish populations, rather than values placed on individual species.

EPA examines two overlapping populations that may place a nonuse value on the aquatic resources of the North Atlantic region — the 3.65 million households located in the counties abutting affected water bodies, and the 4.2 million households living within a 32.4 mile radius of the affected water bodies. The Agency develops both total and per-household value estimates for each of these areas. Using the households in abutting counties, EPA calculates "a total WTP to reduce impingement and entrainment losses of $4.07 to $7.83 and non-use WTP of $3.44 to $6.52 per household residing in the counties abutting affected water bodies." Using the larger area, with the 32.4-mile radius, EPA finds that "implied WTP values to reduce all I&E losses range from $5.63 to $23.43 and non-use WTP range from $5.61 to $21.83 per household residing in the 32.4 mile-radius area."[9]

It is well known that people living a significant distance from a resource can still value that resource. For example, people throughout the US placed a substantial nonuse value on the ecosystems damaged by the Exxon Valdez oil spill — even though Prince William Sound was hardly a household word before the spill occurred.[10] The Grand Canyon has a powerful meaning to people who live outside Arizona; Yellowstone is important to people who live far from

---

[9] NODA, p. 13574-5.

[10] See Richard T. Carson et al., Contingent Valuation and Lost Passive Use: Damages from the Exxon Valdez, Report Submitted to the Alaska Attorney General (Nov. 1992).

Wyoming. There is no reason to think that the aquatic resources of the North Atlantic region are an exception to this pattern. Indeed, both the Atlantic and the Pacific coasts of the US are generally considered to be a national resource and birthright. Schoolchildren across the country — not just in coastal communities — sing about "America the beautiful" stretching "from sea to shining sea." All of this suggests that Americans across the country place a nonuse value on coastal ecosystems.

A model for the analysis of nationwide nonuse values for a local resource can be found in the early work of Robert Stavins. It provides an interesting contrast to his recent criticism of EPA's treatment of nonuse value (and his criticism of our earlier comments on the subject). In 1984 Stavins was the principal author of a cost-benefit analysis of a proposed hydroelectric development on the Tuolumne River, in California.[11] The analysis, which showed that the benefits of development were less than the costs, helped to defeat the proposed dam and to preserve the river in its natural state for recreation. The nonuse benefits of preserving the river were crucial to Stavins' analysis; without those benefits, his calculations would have strongly favored development.

Stavins argued that it was not surprising that the nonuse value of the Tuolumne was large:

> In the case of environmental resources, the so-called nonuser or intrinsic benefits may

---

[11] "The Tuolumne River: Preservation or Development? An Economic Assessment," Environmental Defense Fund, Berkeley CA, March 1984; hereafter cited as "Tuolumne River."

> represent a substantial portion of the resources' total value.[12]

He employed a ratio of nonuse to use value, derived from other published studies, to estimate the per-capita nonuser value. Stavins' next step was to multiply the per-capita nonuser value "by an estimate of the number of people *in various regions of the country* who are likely to" assign a nonuse value to the resource.[13] His estimate of the number of "interested nonusers," as he called them, was the entire California membership of the Sierra Club (some of whom lived hundreds of miles away from the Tuolumne), plus half of the membership of the Sierra Club in the other 49 states. His calculations assigned a sizeable nonuse value to each of these individuals, even those who lived across the continent from the Tuolumne.

Alternatively, he discussed public opinion surveys suggesting that 40% of the US population feels strongly about the preservation of wilderness, and pointed out that his total nonuser benefit estimate could also be the result of 40% of the US population having a willingness to pay to preserve the Tuolumne of just $0.33 per person per year. After calling for more research to determine the nonuse value more directly, he concluded that

> In the meanwhile, however, these estimates represent, at the very least, a reasonable first approximation ... [nonuse value] is too important to be ignored.[14]

---

[12] "Tuolumne River," 158.

[13] "Tuolumne River, "161, emphasis added.

[14] "Tuolumne River," 163.

Following the example of Stavins' early work, we recommend that EPA reconsider its restriction of nonuse value to the population living very close to the plants in question. Suppose, for instance, one accepted EPA's nonuse value for the population in bordering countries, and also assumed that the use value per household in the rest of the country is even 10% as high as in the bordering counties (or alternatively, one could assume that 10% of the households in the rest of the country have a non-use value as high as those in the bordering counties).[15]

There were 106.3 million households in the United States in 2001.[16] Of these, 3.7 million lived in the counties bordering the North Atlantic facilities in question, and 102.6 million lived elsewhere. According to the NODA, the nonuse WTP to eliminate all I&E losses was $20.73 to $33.97 per household in the bordering counties.[17] Thus, our 10% assumption implies that the nonuse WTP for the 102.6 million households in the rest of the country was $2.07 to $3.40 per household; this implies a total nonuse WTP, beyond the bordering counties, of $212.4 to $348.8 million. As shown in Table 2, this adjustment more than triples the total value of baseline losses due to North Atlantic I&E.

---

[15] A similar calculation could be done using EPA's estimates for households within a 32.4 mile radius. The result would be even larger total values than the ones we derive here.

[16] This is the number of occupied housing units, from American Housing Survey 2001, Table 1A-1, available at http://www.census.gov/hhes/www/housing/ahs/ahs01/tab1a1.html.

[17] NODA, p.13574.

Table 2. Value of North Atlantic Baseline Losses

(millions of 2002 dollars)

	Lower bound	Upper bound
Bordering counties - use and nonuse values	79.2	148.2
Rest of country - nonuse value	212.4	348.8
Total	**291.6**	**497.0**

Bordering counties data from NODA Table X-42.
Rest of country data explained in text.

As Stavins accurately observed in 1984, the effect of nationwide nonuse value is too important to be ignored.

Ecosystem values omitted from the NODA. As in EPA's earlier analysis, the NODA omits important categories of ecosystem value — many of them acknowledged and listed by EPA itself. Thus the calculation of benefits of reduced cooling water take is necessarily incomplete; even if EPA had completed a cost-benefit analysis along the lines of the NODA, a comparison of complete costs with such incomplete benefits would be of little value in evaluating public policy options.

EPA notes that it has no information on the stock status of many of the species affected by I&E. For the North Atlantic region, EPA reviews the information available on stock status of 25 stocks (15 species) of groundfish, noting whether a given stock is "subject to overfishing (the harvest rate exceeds threshold)" or "overfished (stock size is below threshold)." Of these

25 stocks, fully 15 are categorized as "currently subject to overfishing," "overfished," "approaching an overfished condition," and/or "in an unknown condition with regard to overfishing."[18]

Thus, more than half of the groundfish stocks considered are in a condition such that, as far as EPA knows, further I&E losses could conceivably drive the population down to zero. While this will presumably not occur for all the listed stocks, a complete quantification of the baseline losses should include the possibility that a given stock of precarious (or unknown) status could be destroyed by continued I&E. Just as cost estimates include the possible shutdown of plants subject to regulation, benefit calculations should include some calculation of the probability that a population will collapse.

To be complete, a benefits analysis should consider all the organisms harmed by I&E losses. Like the analysis conducted for the original ruling, however, the NODA includes no attempt to quantify the value of damage inflicted on birds, or on fish-eating mammals. The NODA also does not look at ecosystem services provided by other organisms likely to be affected by I&E, such as small invertebrates. According to the scientists at Pisces Conservation, important services provided by aquatic ecosystems as a whole include recycling of human waste in waters close to human habitation; demobilization and detoxification of chemical waste products; stabilization and accumulation of sediments, preventing soft sediments from producing turbidity and sedimentation of channels; and support to terrestrial ecosystems

---

[18] NODA, p. 13549.

(including exportation of biomass from water to the land via invertebrates, birds, and mammals).[19]

EPA gives some attention in the NODA to non-fish species such as lobsters and shellfish, but does not explore fully the range of possibility for these species. For example, EPA discusses the high-value lobster fishery of the North Atlantic region and notes that this fishery is currently subject to severe overfishing. However, EPA does not appear to factor into its analysis the possibility that the lobster fishery could collapse due to continued combined pressure from harvesting and from I&E losses. EPA notes that "the Northeast lobster fishery is second in commercial value after the multispecies groundfish fishery,"[20] so the Agency's decisions about how to analyze this population's fate are significant.

By its own admission, EPA consistently underestimates the number of fish lost to I&E.[21] Many

---

[19] Pisces Conservation, Ltd., Technical Evaluation of US Environmental Protection Agency's Proposed Phase II Cooling Water Intake Regulation for Existing Facilities (including Comments on NODA), June 2003.

[20] NODA, p. 13550.

[21] See 316(b) Phase II Economic Benefits Analysis, Part C: National Benefits, Chapter C1: Case Study Introduction, Section C1-5.1: Data Limitations. Available at http://www.epa.gov/waterscience/316b/econbenefits/c1.pdf. EPA notes: "EPA's analysis is based on facility-provided biological monitoring data. These facility-furnished data typically focus on a subset of the fish species impacted by I&E, resulting in an underestimate of the total magnitude of losses.... The facility-derived biological monitoring data often pertain to conditions existing many years ago (e.g., the available biological monitoring often was conducted by the facilities 20 or more years ago, before activities under the Clean Water Act had improved aquatic

of the data on which EPA bases its estimates are outdated, and were collected during a period when some fish stocks were severely depleted. Furthermore, even current data are misleading with regard to total baseline I&E losses, because many fish stocks have been depleted, for instance by years of continual I&E losses. If initial stocks were at natural levels unaffected by past and present I&E, estimated baseline losses would be higher.

In order to quantify the effects of I&E losses on aquatic ecosystems, an analysis must take into account the full range of trophic interactions. Boreman (2000) emphasizes that all fish in an ecosystem, including those considered "surplus," have ecological significance, noting that "use of 'surplus' production is essentially an allocation issue among competitors for that resource." Thus, 'surplus' can be used "for supporting fisheries, for allowing the population to hedge against bad times, for providing extra sustenance for natural predators, or for supporting other uses of the resource."[22]

Link (1999) describes several trophic phenomena that should be taken into account in analyzing the likely effects of anthropogenic damage to fish populations.

---

conditions.) In those locations where water quality was relatively degraded at the time of monitoring relative to current conditions, the numbers and diversity of fish are likely to have been depressed during the monitoring period, resulting in low I&E. In most of the nation's waters, current water quality and fishery levels have improved, so that current I&E losses are likely to be greater than available estimates for depressed populations."

[22] John Boreman, "Surplus production, compensation, and impact assessments of power plants," *Environmental Science and Policy* 3 (2000) S445-S449.

One of these is the phenomenon of cycles, in which species A feeds on species B at one life stage, while B feeds on A at another life stage. These cycles can lead to "stock bottlenecks" and can create a negative feedback loop as populations change. Likewise, cannibalism, in which fish consume younger members of the same species, can also interact with these cycles to create negative feedback loops. Link constructs a simplified model of the food web in the northwest Atlantic system in which humans are just one of 75 distinct nodes (some of which represent tens or hundreds of individual species, as Pisces explains in their NODA comments). Link emphasizes the "stochastic nature of this ecosystem" and the "consequent uncertainty in the predictions...." emerging from a system with complex dynamics.[23] Strictly speaking, if we are to correctly carry out the goal of quantifying the benefits of saving an aquatic ecosystem, all the elements of Link's model should be examined and traced through to a service that can be quantified and valued. Examining all these elements may well be an impossibly or impractically large task; once again, this problem highlights the difficulty of using a flawed methodology to develop policy.

The NODA relies on other questionable methodologies as well. The grounds for discounting future environmental benefits are debatable; underwater ecosystems are not financial assets that can be consumed or saved, depending on an investor's

---

[23] Link, J.S., 1999, (Re)Constructing Food Webs and Managing Fisheries, in *Ecosystem Approaches for Fisheries Management*, Alaska Sea Grant College Program. AK-SG-99-01, at p.10.

rate of time preference.[24] The calculation of producer surplus, an important part of the estimated use value of fish killed by I&E, is based on a "rule of thumb" derived from just a few published studies – and is now estimated to be significantly smaller than in the EBA.[25] While these points do not have a large impact on the overall benefits estimate in the NODA, they are worth noting for future analyses.

4. Responses to Stavins Comments

In comments submitted in this docket, dated April 21, 2003, Dr. Stavins (who is now commenting on behalf of PG&E Energy Systems) responds in detail to our earlier comments on EPA's original cost-benefit analysis. Stavins repeatedly asserts, on the basis of his personal judgment, that we have confused positive and normative analysis or otherwise misunderstood basic principles of economics. Many, though not all, of the issues he raises remain relevant to the NODA. A point-by-point response is inappropriate here; suffice it to say that we continue to disagree on numerous aspects of the substance of the analysis, some of them discussed above.

Perhaps our most important disagreement concerns the magnitude of the environmental damages at stake. See, for instance, Stavins' statement that it was appropriate for him to estimate little or no nonuse value because only "*incremental* changes in the populations of various aquatic species" are involved in this case (April 21, 2003 letter, p.10, emphasis in

---

[24] Frank Ackerman and Lisa Heinzerling, "Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection," *University of Pennsylvania Law Review* 150 (May 2002): 1553.

[25] NODA, p.13548, 13556.

original). Since EPA is valuing individuals, not populations, all the changes being analyzed are in a sense "incremental," though perhaps fairly big increments in some cases. Stavins' wording on this subject suggests a prior judgment that the increments at stake are, in fact, all so small that their nonuse value can be ignored.

We also want to respond briefly to Stavins' unfounded claims about the economics profession, and the extent of dissent within it. In effect, Stavins asserts that all reputable economists agree with him, and rejects our statements about the extent and influence of dissenting voices within the profession. To cite only the most important example, we mentioned that Amartya Sen, a recent Nobel laureate in economics (and the source of many provocative, innovative new approaches), rejected the idea of *individual* willingness to pay as a measure of the value of major environmental problems, because a rational individual's willingness to pay depends on what others are doing. Stavins suggests that we misinterpreted Sen, who, he says, was merely making a minor technical point about the free rider problem in the provision of public goods. Here is what Sen actually said on the subject:

> The philosophy behind contingent valuation [CV] seems to lie in the idea that an environmental good can be seen in essentially the same way as a normal private commodity that we purchase and consume. The valuation that is thus expressed is that of achieving single-handedly — this is crucial — this environmental benefit. Consider, for example, a case in which it is inquired how much I would

> pay to save all the living creatures that perished as a result of the *Exxon Valdez* disaster, and I say $20. As interpreted in CV, it is now presumed that if $20 paid by me would wipe out altogether all these losses, then I am ready to make that payment. It is hard to imagine that this question and answer can be taken seriously by any practical person (with some idea of what the *Exxon Valdez* disaster produced), since the state of affairs I am asked to imagine could not possibly be true.[26]

5. *Conclusion: The Need For Alternative Approaches*

Comparison of costs and benefits is not a necessary part of the decision about regulation of cooling water intake systems. The language of the Clean Water Act does not require cost-benefit analysis; rather, like many other environmental statutes, it sets forth technology and performance-based standards for protection of our natural environment. Retrospective analysis has shown that technology-based regulation is not always the economic disaster that regulatory critics sometimes suggest. For example, a massive, peer-reviewed study found that the first twenty years of the Clean Air Act had monetized benefits of more than $20 trillion, or more than 40 times its costs.[27]

It is fortunate that good decisions can be made without cost-benefit analysis, because it is so often

---

[26] Amartya Sen, "The Discipline of Cost-Benefit Analysis," *Journal of Legal Studies* 29 (2) part 2, June 2000, 931-952, quote from 948.

[27] US EPA, *The Benefits and Costs of the Clean Air Act, 1970 to 1990* (October 1997).

necessary. The problems we have cited in the analysis of the benefits of regulating cooling water intake systems are similar to problems that arise in many cost-benefit studies. Many costs are readily monetized, while many of the benefits of protecting life, health, nature, and future generations are, literally, priceless — not infinite in value, but rather, incapable of meaningful monetization.[28] A broader, multi-dimensional approach to decision-making is required to reflect society's true preferences in such cases; technical economic analysis alone cannot reliably produce the right answers to questions of regulation and environmental protection.

Here we restrict our attention to a narrower question of alternative methods: when a comparison of costs and benefits is desired, what methods should be used? In our previous comments, we recommended that EPA abandon the impossible effort to calculate monetary values for all relevant benefits and costs of regulatory options. Instead, we recommended that the Agency simply calculate the cost per household of implementing regulations to protect aquatic ecosystems. These cost calculations could then allow a comparison of aggregate (largely monetized) costs and aggregate (largely non-monetized) benefits. The aggregate comparison of dissimilar categories of value is more sensible than the attempt at disaggregation and monetization of every conceivable benefit. The aggregate comparison recognizes the broad political and social, as opposed to narrow, technical and economic, nature of decisions about protection of natural resources.

---

[28] Ackerman and Heinzerling, "Pricing the Priceless."

The "break-even" methodology that EPA proposes in the NODA is a promising start in this direction, but does not go far enough. Recognizing that it is far easier to estimate complete costs than complete benefits, the break-even calculation identifies the cost per household of regulations. However, this cost is presented in the NODA as a hurdle that has to be cleared by the data-intensive calculation of benefit values. We recommend that EPA go further, presenting costs per household of different regulatory options as key inputs into public decision-making. These costs could be accompanied by quantitative and qualitative descriptions, in natural units (e.g., numbers of various species of fish killed, not hypothesized monetary values of those fish), of the benefits of regulation — a vastly simpler task than the NODA agenda of monetization, or even last year's cost-benefit calculations. Under our method, there would undoubtedly still be controversy about the details of the cost calculations, and of the description of benefits - but these would be far simpler, more transparent and manageable disputes than the ones surrounding cost-benefit analysis.

The ultimate problem is that the conventional methodology of cost-benefit analysis, no matter how carefully performed, is still a conceptually flawed and inadequate method. As Robert Stavins eloquently expressed it in his Tuolumne analysis,

> When particular categories of benefits and/or costs are systematically excluded from an economic assessment, benefit-cost analysis loses its value as an aid to societal decision-making ... The B/C [benefit-cost] criterion is neither a necessary nor a sufficient condition

> for project investment ... What is crucial to keep in mind is that the benefit-cost criterion should not be used as an absolute decision rule ... Public-policy decisions regarding the use of the nation's scarce natural resources are ultimately political decisions, and should remain so.[29]

In the words of Amartya Sen,

> When all the requirements of ubiquitous market-centered evaluation have been incorporated into the procedures of cost-benefit analysis, it is not so much a discipline as a daydream. If, however, the results are tested only in terms of internal consistency, rather than by their plausibility beyond the limits of the narrowly chosen system, the glaring defects remain hidden and escape exposure.[30]

In conclusion, we regret that the limited scope of the NODA prevents us from commenting fully in advance of the final rule. The lack of information in the NODA creates a serious lack of transparency in EPA's decision-making process; we have no way to examine or evaluate the calculations that will, presumably, form the basis for EPA's final ruling. We recommend first, recognition that comparison of costs and benefits is not the only way to make good decisions, nor is it the method of decision-making set forth in the Clean Water Act. Second, when comparisons of costs and benefits are desired, we recommend that an alternative method of comparison be adopted, building on the foundation of

---

[29] "Tuolumne River," 16, 31, 32, 101.

[30] Sen, "Discipline of Cost-Benefit Analysis," 952.

EPA's break-even calculation and comparing monetary costs to environmental benefits. In our view, this will highlight the vast ecological benefits available from strict regulation of cooling water intake systems, at a very modest nationwide average cost — a bargain we believe the American people should, and would, accept.

Sincerely,

Frank Ackerman
Rachel Massey

Comment ID 316bEFR.006.003

Subject Matter Code	10.07.02
RFC: Appropriateness of "significantly greater"	

Author Name Paul E. Reynolds

Organization Hoosier Energy Rural Elect. Co-op

"Significantly Greater"

The proposal provides for a site-specific determination of the "best technology available" if the costs of compliance at a site would be "significantly greater" than either the benefits of meeting the performance standards or the cost of what the agency considered. EPA must provide a clear definition of what is meant by "significantly greater." To maximize net benefits to society, economic theory would dictate that this should be interpreted to mean any cost benefit ratio greater that 1:1. This reflects the most cost-effective, performance-based outcome.

EPA Response

Under § 125.94(a)(5), a Phase II existing facility may seek a site-specific determination of best technology available if the Director determines, based on the facility's demonstration, that its compliance costs would be significantly greater than the costs

determined by the Administrator in establishing the final rule performance standards, or if its costs of compliance are significantly greater than the benefits of complying with the performance standards at the facility. As discussed in the proposed rule at 67 FR 17145 - 17146 (April 9, 2002), EPA has adopted the significantly greater cost-cost standard, rather the wholly disproportionate standard used in the Phase I rule, based on the fact that new facilities, regulated under Phase I, have greater flexibility than existing facilities, regulated under Phase II, in selecting the location of their intakes and technologies for minimizing adverse environmental impact so as to avoid potentially high costs, and it is therefore appropriate to push such facilities through use of a more stringent economic standard. In contrast, Phase II existing facilities encounter more substantial retrofit challenges (e.g., retrofitting an existing facility requires special consideration of various factors, including but not limited to the adequacy of space to accommodate a technology, approval and special conditions to locate such technology, potential redesign of intake, piping and cooling system components, often unique construction concerns, and secondary effects) and associated costs, and thus warrant somewhat broader flexibility. In addition, in contrast to the Phase I rule, the Phase II rule affects a significant portion of existing electric generating capacity. Thus, EPA believes it is appropriate to set a lower cost threshold in this rule to avoid economically impracticable impacts on energy prices, production costs, and energy production that might otherwise occur.

EPA has not expressly defined the term "significantly greater" in this rule. The Agency believes that a general standard, to be applied by the Director on case-by-case basis, is more appropriate for application in this rule since such a standard preserves reasonable discretion for the Director to compare assessments of costs and/or benefits, and make determinations that ensure that the costs of the rule are economically practicable or that there is a reasonable relationship between the costs of cooling water intake technology and the environmental benefits associated with its use. Numerous factors are considered in assessing costs and benefits, and use of a general standard allows an appropriate consideration of the totality of these factors under the rule. EPA notes that the "wholly disproportionate" standard applied historically, and as used in the Phase I rule, are not explicitly defined. The former has proven workable and, although it is too early to assess, the latter appears equally useful.

Also see response to 316bEFR.018.009 and 045.012.

Comment ID 316bEFR.010.027

Subject Matter Code	17.03.02
RFC: EPA rationale to not require closed-cycle	

Author Name Carl Michael Smith

Organization Dept of Energy

Wet Cooling Towers Should Not Be Required Except on a Case-by-Case Basis - Although EPA's proposed rule does not directly require any facilities to convert their cooling systems to wet cooling towers, some of the alternative options presented do require wet towers or their flow-based equivalents at some subset of facilities. DOE does not believe that the Phase II rule should require any particular class of facilities to convert to wet towers. We acknowledge that some existing, once-through cooled plants are causing AEI and will need to make some changes to their current operations. These changes could involve a combination of new intake technologies, or voluntary operational changes, and restoration measures. Some companies may elect to install wet cooling towers in order to minimize AEI. We believe that these cases will be infrequent, however.

In most cases, the costs to retrofit wet cooling towers will far exceed the costs to employ other remedies. We

---

are pleased that EPA states on page 17155 that it did not select wet cooling towers as the best technology available for existing facilities because of the high costs of the retrofits and the potential for energy shortfalls related to concurrent retrofits at multiple plants. Even though we agree with EPA's decision, we feel that for several reasons the EPA projections of the costs and energy impacts of retrofit to wet towers have been underestimated. EPA presents their estimate of the cooling system conversion capital costs to be $53 per kW (moderate) to $62 per kW (high)—(Appendix C, Phase II Technical Development Document (TDD), page C-5). In comparison NETL has developed retrofit cost estimates through a draft study by its contractor, Parsons Infrastructure and Technology Group. That draft report (forthcoming), entitled "An Investigation of Site-Specific Factors for Retrofitting Recirculating Cooling Towers at Existing Power Plants," estimates wet cooling tower retrofit costs at four sites. The site-specific nature of wet cooling system retrofits at existing facilities is further underscored by the wide range of the cost estimates for the four sites in that draft study which are $66 per kW to $128 per kW. These estimates are on a similar basis as the EPA estimates.

Neither the EPA nor the NETL cost estimates take into account certain site specific factors such as plume abatement. DOE feels that the Agency should have made some assumptions in their cost estimates for a range of site-specific factors affecting the costs of retrofits at existing facilities. These factors include, but are not limited to, the necessity for plume abatement and/or drift control for facilities located in

urban areas or in close proximity to highways or airports, and the location of existing underground utilities that may have to be re-routed to accommodate the recirculating system's piping lay-out. For one of the sites in the NETL draft study, the capital cost of the cooling tower alone would double should the local permitting authority require the use of plume abatement. This was not included in the costs presented in the study. However if 1 out of 4 sites studied may have needed plume abatement, we believe EPA should have assumed that a certain number of facilities in their national cost estimate included site-specific retrofit costs such as plume abatement (see Comment 26).

EPA Response

No response is required for this comment as DOE is a Federal partner in the rulemaking.

Comment ID 316bEFR.010.057

Subject Matter Code	9.0
	Costs

Author Name Carl Michael Smith

Organization Dept of Energy

Compliance Cost Estimate - Section B1, Page B1-17. EPA identifies uncertainties and limitations to their compliance cost estimate. However, EPA does not identify uncertainty in their cost estimating procedure. For instance, what is the level of uncertainty in the capital cost estimate? This is the largest cost element provided in Table B 1-7, yet there is no mention of the level of accuracy for such an estimate. The reader is unclear whether this is based on conceptual, preliminary, or detailed engineering studies for all potentially affected facilities. The level of accuracy expected from EPA's cost estimation methodology should be discussed. Moreover, EPA's cost analysis for wet cooling tower retrofits neglects to make any allowance for site-specific requirements which may be mandated by State and local ordinances for plume cooling tower installation.

Through a web search on plume abated cooling towers, DOE was able to identify the following URL's describing either new facilities that will employ wet

cooling tower technology, or existing facilities that are retrofitting with wet cooling towers. DOE offers the following websites for EPA's consideration:

AES Granite Ridge, Londonderry, NH: http://www.aesc.com/londonderry/aesl_qna.html

NIST nuclear plant: http:///www.ncnr.nist.gov/AnnualReport/FY2000/operations.pdf and http://www. frm2.tu-muenchen.de/igorr/igorr-n113/ig-nl13-11.html

FPL Sacramento Power LLC: http://www.energy.ca.gov/sitingcases/riolinda/documents/applicants_files/2001-08-22_PROP_REVISION.PDF

Blythe Energy LLC: http:/www.energy.ca.gov/sitingcases/blythe/documents/2001-03-06_APPLICANTCOMMENT.PDF

Orion Power: http://www.orion.ene.com/files/executive_ summary/S11.pdf

Agnews Plant (Calpine) – San Jose, CA: http://www.santateresacitizen.org/plume.html

Calgary Energy Centre (Calpine): http://calgary energy. calpine.com/docs/Jan01_newsletter.pdf

Empire State Newsprint, Albany, NY: http://www.besicorp.com/empire/info.html

Metcalf Energy Center (Calpine), Santa Clara County, CA: http://www.metcalfenergycenter.com/execsummary. asp

New York Power Authority, Astoria Plant, Queens, NY, new 500 MW CC: http://www.nypa.gov/ccf/NYPA%20Article%20X/text/Section%202.0%20Public%20Involvement%20(final).pdf

Badger Generating Co. LLC, Kenosha County, WI , new 1050 MW CC: http://www.psc.state.wi.us/cases/badger/exec_sum.htm

Customer list – Plume Abatement Cooling Towers – Emcotek: http://www.emcotek.com/references.htm

Duke Energy Morrow Bay Power Plant, conversion of 1058 MW gas-fired steam plant from once-through saline water cooling to cooling towers (saline water): http://www.morro-bay.ca.us/rwqcbsup.pdf

FPL Energy Elverta Power Project, Rio Linda, CA: http://obri.net/stop/fplcpac.html

Athens Generating Company, Athens, Greene County, NY, 1080 MW CC: http://www.stoptheplant.org/parks_and_recreation_brief.htm

From this list, it appears as though plume abatement features are commonly employed in new and retrofit wet cooling towers thereby further supporting DOE's position.

As can be seen by visiting the URL's identified on the list, plume abatement is not required by EPA rules, but by local permitting regulations. These regulations generally require that "visual impacts" of any proposed new installation be minimized. This usually means eliminating any visible vapor plume from a cooling

tower. If there is an airport anywhere in the vicinity, the FAA will also have to evaluate any potential visibility or icing impacts from a cooling tower vapor plume.

After reviewing this information, it seems obvious that by neglecting plume abatement entirely in their cost analysis, EPA is considerably underestimating the cost of compliance with the proposed Phase II regulations for options 1 and 4, given that plume abatement approximately doubles the cost of the cooling tower (by EPA's own cost estimate).

Additional costs should also be included for materials that would appropriately handle brackish or saline water. As EPA has indicated in a fax sent to NETL (D. Nagle to E. Parsons, January 18, 2002), these additional costs should be valued at 25 percent of tower costs. DOE agrees that this is a reasonable factor for corrosion resistant materials and drift elimination technology.

EPA Response

No Response Necessary to DOE comment.

Comment ID 316bEFR.010.101

Subject Matter Code	9.0
	Costs

Author Name Carl Michael Smith

Organization Dept of Energy

Energy Penalty Analysis of Possible Cooling Water Intake Structure Requirements on Existing Coal-Fired Power Plants

US Department of Energy

Working Draft -- May 23, 2002

1.0 Executive Summary

Section 316(b) of the Clean Water Act requires that cooling water intake structures must reflect the best technology available for minimizing adverse environmental impact. Many existing power plants in the United States utilize once-through cooling systems to condense steam. Once-through systems withdraw large volumes (often hundreds of millions of gallons per day) of water from surface water bodies. As the water is withdrawn, fish and other aquatic organisms can be trapped against the screens or other parts of the intake structure (impingement) or if small enough, can pass

---

through the intake structure and be transported through the cooling system to the condenser (entrainment). Both of these processes can injure or kill the organisms. EPA adopted 316(b) regulations for new facilities (Phase I) on December 18, 2001. Under the final rule, most new facilities could be expected to install recirculating cooling systems, primarily wet cooling towers. The EPA Administrator signed proposed 316(b) regulations for existing facilities (Phase II) on February 28, 2002. The lead option in this proposal would allow most existing facilities to achieve compliance without requiring them to convert once-through cooling systems to recirculating systems. However, one of the alternate options being proposed would require recirculating cooling in selected plants.

EPA is considering various options to determine best technology available. Among the options under consideration are wet-cooling towers and dry-cooling towers. Both types of towers are considered to be part of recirculating cooling systems, in which the cooling water is continuously recycled from the condenser, where it absorbs heat by cooling and condensing steam, to the tower, where it rejects heat to the atmosphere before returning to the condenser. Some water is lost to evaporation (wet tower only) and other water is removed from the recirculating system as a blow down stream to control the building up of suspended and dissolved solids. Makeup water is withdrawn, usually from surface water bodies, to replace the lost water. The volume of makeup water is many times smaller than the volume needed to operate a once-through system.

[Footer omitted in printing.]

Although neither the final new facility rule nor the proposed existing facility rule require dry cooling towers as the national best technology available, the environmental community and several States have supported the use of dry-cooling technology as the appropriate technology for addressing adverse environmental impacts. It is possible that the requirements included in the new facility rule and the ongoing push for dry cooling systems by some stakeholders may have a role in shaping the rule for existing facilities. The temperature of the cooling water entering the condenser affects the performance of the turbine—the cooler the temperature, the better the performance. This is because the cooling water temperature affects the level of vacuum at the discharge of the steam turbine. As cooling water temperatures decrease, a higher vacuum can be produced and additional energy can be extracted. On an annual average, oncethrough cooling water has a lower temperature than recirculated water from a cooling tower. By switching a once-through cooling system to a cooling tower, less energy can be generated by the power plant from the same amount of fuel. This reduction in energy output is known as the energy penalty. If a switch away from once-through cooling is broadly implemented through a final 316(b) rule or other regulatory initiatives, the energy penalty could result in adverse effects on energy supplies.

Therefore, in accordance with the recommendations of the Report of the National Energy Policy Development Group (better known as the May 2001 National Energy Policy), the U.S. Department of Energy (DOE), through its Office of Fossil Energy, National Energy

Technology Laboratory (NETL), and Argonne National Laboratory (ANL), has studied the energy penalty resulting from converting plants with once-through cooling to wet towers or indirect-dry towers. Five locations – Delaware River Basin (Philadelphia), Michigan/Great Lakes (Detroit), Ohio River Valley (Indianapolis), South (Atlanta), and Southwest (Yuma) – were modeled using an ASPEN simulator model. The model evaluated the performance and energy penalty for hypothetical 400-MW coal-fired plants that were retrofitted from using once-through cooling systems to wet- and dry-recirculating systems. The modeling was initially done to simulate the hottest time of the year using temperature input values that are exceeded only 1 percent of the time between June through September at each modeled location. These are the same temperature inputs commonly used by cooling tower designers to ensure that towers perform properly under most climatic conditions. The high temperature inputs correspond to the time of year when the highest power demands are observed and the needs for generating capacity are most critical due to the very high cost of buying replacement power on the spot market. Later, modeling was completed to estimate the monthly energy penalties, which were arithmetically averaged to generate an estimate of annual average energy penalty.

The results of the one-percent-high temperature modeling show that conversion to a wet tower could cause energy penalties ranging from 2.4 percent to 4.0 percent. This means that the plant will produce 2.4 percent to 4.0 percent less electricity with a wet tower than it did with a oncethrough system while burning

the same amount of coal. That lost electricity could be made up at this plant or at some other existing or new plant by burning additional fuel. These peak-summer penalties are somewhat higher than those estimated by EPA in the technical documentation published with its April 9, 2002 proposal for existing facilities. DOE believes that EPA did not include all the relevant costs and made some inappropriate assumptions; these are described at the end of Chapter 4. When more appropriate costs and assumptions are considered, EPA estimates compare favorably with those in this report.

Conversion to an indirect-dry tower, where possible, could cause energy penalties ranging from about 8.9 percent to 12.14 percent using 20 degrees F for the approach (the difference between the inlet air dry-bulb temperature and the desired cold water temperature), and 12.7 percent to almost 16 percent using an approach of 40 degrees F. The industry norm for indirect dry towers – a 40-degree approach—was evaluated initially, but the resulting pressures for the steam turbines were found to result in unacceptable operating conditions during the one-percent highest temperature times of the year. The mostly likely way that a company could operate a retrofitted indirect-dry tower at a 40-degree approach would be to reduce the power output from the plant (load shedding) during the hottest times of the year – just when the power demand is the greatest.

This power output reduction imparts an immediate energy penalty. On completion of the analysis it was determined that even if load shedding was attempted

on all the 40-degree approach cases it would still be technically infeasible to operate the turbines safely during the summer months. To provide more information on dry tower energy penalties, a more conservative approach of 20 degrees was subsequently modeled.

The results of the annual energy penalty modeling show that conversion to a wet tower could cause energy penalties ranging from 0.8 percent to 1.5 percent. Conversion to an indirect-dry tower could cause energy penalties ranging from about 4.2 percent to 5.2 percent using 20 degrees F for the approach, and 7.9 percent to almost 8.8 percent using an approach of 40 degrees F.

A review of the "Environmental Directory of US Powerplants" (EEI 1996) indicated that in 1996, there were 258,906 MW of electric generating capacity in the United States that consisted of steam electric power plants employing once-through cooling. The one percent highest temperature analysis modeled plants in just five locations and under very warm temperature conditions, but the modeled facilities are believed to be representative of the climatic conditions found throughout those portions of the country where once-through cooling is prevalent. It is quite possible that much of the Nation could experience very high temperatures at the same time (e.g., week of August 6, 2001), leading to results even more extreme than those calculated here. Tables ES-1 and ES-2 demonstrate the effects on electric generating capacity during the one-percent highest temperature conditions if 10, 25, 50, or 100 percent of the existing once-through cooled

power plants in the United States were required to convert to either wet or indirect-dry cooling towers. The example of a requirement for 100 percent of the plants to retrofit to either wet or dry towers is hypothetical since it would be technically infeasible to do either. The energy, time, and expense required to make up for these losses is significant and would not necessarily require building new plants. But for example in the "average" case, 19 additional 400-MW plants might have to be built to replace the generating capacity lost by replacing oncethrough cooling with wet cooling towers in 100 percent of existing steam plants. If some of those affected plants were required to retrofit an indirect-dry tower, the energy penalty impacts would be over three times higher. For example, the "average" case might require 66 new 400-MW plants to be built to replace the generating capacity lost by replacing once-through cooling with indirect dry cooling towers with a 20-degree air-side approach in 100 percent of existing steam plants. This example of new plants needed if 100 percent of existing plants were required to retrofit to dry towers is far too low since after thoroughly completing this analysis it has been determined that it would be impossible for most existing plants to be retrofitted to dry towers at many locations and therefore there would be a need for closures and far more new power plants than provided in the simple example above.

These new power plants may be needed to replace the energy lost as a result of the conversion from once-through to recirculating cooling, and do not reflect the need to build additional new generating capacity to meet the nation's growing demands for electricity. The

U.S. Department of Energy's Annual Energy Outlook states that anticipated growth in electricity sales between 2000 and 2020 is about 1.8 percent per year (EIA 2001a). Alternatively, some of the existing plants that might have to retrofit to either wet or indirect-dry cooling systems may be able to just burn more fuel to replace the electricity lost due to the cooling system conversion. Either way, additional fuel will be burned and other adverse environmental impacts will be created such as increased emissions, land use, and noise pollution.

To more closely evaluate the impact of increased air emissions from burning additional fuel, several additional analyses were performed. Estimates of incremental air emissions were made using the average annual energy penalty results at the Delaware River Basin site and the South site. The results show that when once-through cooled plants are converted to wet cooling towers, the incremental air emissions are not large on a percentage basis (generally less than one percent), but the absolute increases in pounds or tons of key air pollutants (SO2, NOx, PM, mercury, and CO2) are large nonetheless. If once-through cooled plants are converted to indirect-dry towers, however, the incremental air emissions can be significant. For dry towers with a 20-degree approach, the percentage increase in air emissions can exceed 4 percent depending on how the power company makes up the lost energy. For dry towers with a 40-degree approach, the percentage increase in air emissions can approach 8 percent and the number of additional pounds or tons is quite large.

[Footer omitted in printing.]

Incremental air emissions are of greatest concern in nonattainment areas. Nonattainment areas are identified for "criteria pollutants" established under the 1970 Amendments to the Clean Air Act that do not meet standards set by EPA. The term "criteria pollutants" derives from the requirement that EPA must describe the characteristics and potential health and welfare effects of these pollutants. It is on the basis of these criteria that standards are set or revised. Although a national impact analysis is not performed in the present study, a general conclusion is that incremental air emissions are counterproductive to achieving standards set by EPA for air quality. There are a number of nonattainment locations throughout the United States where incremental air emissions could occur from an energy penalty associated with a requirement to add a cooling tower to existing power plants.

One important finding of this report is that neither indirect-dry nor direct-dry towers are viable as a retrofit technology at most U.S. locations under the one-percent-highest temperature conditions. As previously noted, many of the model runs evaluating conversion to indirect-dry towers resulted in calculated turbine pressures that exceeded the upper limit for safe turbine operation. This was true of all of the model runs made using the 40-degree approach assumption and for one quarter of the runs made at 20 degrees. The point should be made that the practice of load shedding, a method of reducing the steam load through the turbine, thereby reducing the condenser heat duty by a proportional amount, would not effectively lower the turbine backpressure enough for

safe operation under the runs modeled with a 40-degree approach assumption. Even for those 20-degree approach cases in which the turbine pressures were below the upper safe limit, an indirect-dry tower would occupy huge amounts of space, which may not be available in an existing plant originally built with once through cooling. The results of sizing calculations to determine the required footprint area for a representative case of retrofitting to indirect dry towers at a 20-degree approach are discussed in section 10.2. Direct-dry towers are not practical either. In an existing plant, there simply is no room for the large-diameter ductwork required to conduct -atmospheric steam from the turbine exhaust hood to a direct-dry cooling tower.

Dry towers have been used as part of newly constructed cooling systems. If the entire power generating system (boiler, turbine, condenser, and cooling) is designed with dry cooling in mind, dry cooling does have applications. For retrofitted dry towers, the issues of large footprint and high energy penalty are important.

Table ES-1 - Wet Cooling Tower Energy Penalties and Impact at One Percent Highest Temperature Conditions

[see hard copy for table]

Table ES-2 - Indirect-Dry Cooling Tower Energy Penalties and Impact at One Percent Highest Temperature Conditions

[see hard copy for table]

[Footer omitted in printing.]

2.0 Glossary

[see hard copy]

3.0 Introduction

3.1 Legal Background for Cooling Water Intake Structure Requirements

Section 316(b) of the Clean Water Act, enacted by Congress in 1972, addresses withdrawal of cooling water from surface water bodies, as follows:

Any standard established pursuant to section 301 or section 306 of this Act and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

In 1976, the U.S. Environmental Protection Agency (EPA) promulgated final §316(b) regulations (April 26, 1976; 41 FR 17387). However, those regulations were successfully challenged by a group of 58 utilities [Appalachian Power Co. v. Train, 10 ERC 1965 (4th Cir. 1977)]. In 1979, EPA formally withdrew its §316(b) regulations (June 1979; 44 FR 32956). As a consequence of the vacuum created by the absence of Federal regulations, many States adopted their own cooling water intake regulations to implement the §316(b) requirements. The broad statutory language facilitated widely differing interpretations by the States. Some adopted comprehensive programs, others imposed less rigorous requirements, and still others never developed formal regulations.

In the mid-1990s, a coalition of environmental groups, headed by the Hudson Riverkeeper, filed suit against EPA over failure to repromulgate §316(b) regulations [Cronin, et al. v. Reilly, 93 Civ. 0314 (AGS)]. On October 10, 1995, the U.S. District Court, Southern District of New York, entered a Consent Decree between the parties, directing EPA to regulate cooling water intake structures within 7 years. Under the Consent Decree, EPA agreed to propose regulations by June 1999 and promulgate a final rule by 2001. The Consent Decree was modified on November 21, 2000 to: a) finalize new facility regulations by November 9, 2001; b) propose existing source large utility and non-utility power producer regulations by February 28, 2002 and issue final regulations by August 28, 2003; and c) propose regulations by June 15, 2003 and issue final regulations by December 15, 2004 for other existing facilities not covered in b) above.

3.2 Purpose of This Report

EPA adopted 316(b) regulations for new facilities on December 18, 2001 (66 FR 65256). Under the final rule, most new facilities could be expected to install recirculating cooling systems, primarily wet cooling towers. The EPA Adminstrator signed proposed 316(b) regulations for existing facilities on February 28, 2002. The lead option in this proposal would allow most existing facilities to achieve compliance without needing to convert once-through cooling systems to recirculating systems. However, one of the alternative options proposed requires recirculating cooling in selected plants.

[Footer omitted in printing.]

Until this rule is finalized, retrofitting to recirculating cooling remains a regulatory option.

Although neither the final new facility rule nor the proposed existing facility rule require dry cooling towers as the national best technology available, the environmental community and several States have supported the use of dry-cooling technology as the appropriate technology for addressing adverse environmental impacts. It is possible that the requirements included in the new facility rule and the ongoing push for dry cooling systems by some stakeholders may have a role in shaping the rule for existing facilities. Recognizing that over 50 percent of the existing coal-fired power plants employ once-through cooling systems, a decision to require many or all of these plants to install dry- or wet-cooling tower systems could have impacts on electricity costs and availability as well as secondary environmental impacts.

The purpose of this report is to quantify the loss of net electric output from an existing coal-fired power plant that would result from the replacement of its once-through cooling system to either a wet- or a dry-cooling tower. The reduction in net electric output is known as the energy penalty and is discussed below. Modeling was done for five locations to simulate the hottest time of the year using temperature values that are exceeded only 1 percent of the time between June through September at each modeled location. This corresponds to the time of year when the highest power demands are observed. To give an idea of the energy penalty at times other than the hottest period of the year,

additional modeling was conducted on a monthly basis. This technique allowed for the calculation of an annual average energy penalty value at each site.

In order to compensate for the electricity lost as a result of the energy penalty, utilities would need to produce more electricity through burning additional fuel, thereby generating additional air emissions. A second purpose of this report is to quantify the additional amount of air emissions that would result at existing coal-fired plants using wet or dry cooling systems. Estimates of incremental air emissions were made at the Delaware River Basin and the South sites.

4.0 Overview of Cooling Systems at Steam Electric Power Plants

4.1 Cooling Water Use

Water is used in many industrial applications to cool machinery or to condense steam. The largest industrial user of cooling water is the steam electric power industry. Data from a recent U.S. Geological Survey (USGS) report indicate that steam electric power generation uses approximately 190 billion gallons of water per day (USGS 1998). In 1999, more than 60 percent of the utility power generating capacity in the United States (382,270 MW) utilized the steam-electric process (EIA 2000). At nuclear and fossil-fuel power plants, electricity is produced by heating purified water to create high-pressure steam. The steam is expanded in turbines, which drive the generators that produce electricity. After leaving the turbines, the steam passes through a condenser that has multiple

tubes and a large surface area. A large volume of cool water circulates through the tubes, absorbing heat from the steam. As the steam cools and condenses, the temperature of the cooling water rises.

4.2 Types of Cooling Systems at Steam Electric Power Plants

Most power plants use either once-through cooling or recirculating cooling. Once-through cooling systems withdraw large volumes of water — typically in the range of tens of millions to billions of gallons per day from a river, lake, estuary, or ocean. The water is pumped through the condenser and finally returned to the same or a nearby water body. Recirculating cooling systems receive their cooling water from and return it to a cooling tower and basin, cooling pond, or cooling lake. Because evaporation and planned cooling tower blowdown (periodic discharges of portions of the recirculating water to remove build up of solids and other undesirable constituents) removes cooling water from the evaporative system, regular additions of "makeup" cooling water are needed. Makeup volumes are much lower than daily once-through volumes, and may range from hundreds of thousands to millions of gallons per day. The USGS estimates that about 2 percent of the water withdrawn for steam electric power generation was consumed as a result of once-through cooling, cooling towers, or pond cooling (USGS 1998).

This report considers two types of recirculating cooling systems – wet towers and indirect-dry towers. These are defined in Section 2 and described in Section 5.3.

4.3 How Cooling Water Affects Steam Power Plant Performance

High-pressure steam is generated in a boiler whose heat source is a high temperature atmospheric pressure furnace fired by some type of fossil fuel or a nuclear reactor. The high-pressure steam is expanded through a multistage turbine that turns a generator to produce electricity. Spent exhaust steam exiting the turbine is condensed and recycled to the boiler for steam production. During the condensation process, a large quantity of low-grade heat is absorbed by the condenser coolant, which is typically water.

The steam side of the condenser operates under vacuum conditions (i.e., a pressure below normal atmospheric pressure). The magnitude of the condenser vacuum depends chiefly upon the condenser design and the incoming temperature of the condenser coolant. Lower coolant temperatures will produce a larger vacuum in the condenser that, to a certain extent, has a favorable effect on performance. Likewise, higher condenser coolant temperatures are associated with a smaller vacuum, resulting in reduced energy output. These relationships are based on the laws of thermodynamics and hold true regardless of the type of cooling system used (once-through or recirculating).

4.4 The Energy Penalty

Steam condensers are designed to produce a vacuum at the outlet end of the turbine, thereby increasing the efficiency of the system. The temperature of the

cooling water exiting the condenser affects the performance of the turbine — the cooler the temperature, the better the performance. As cooling water temperatures decrease, a higher level of vacuum can be produced and additional energy can be extracted. On an annual average, once-through cooling water has a lower temperature than recirculated water from a cooling tower. Because most of the heat rejection in a wet cooling tower is due to evaporation, the temperature of the recirculated cooling water is limited by the ambient air wet- bulb temperature. It can never be lower than the wet-bulb temperature and generally is about 5 to 10 F higher. As a result of switching from a once-through cooling system to a cooling tower, less energy can be generated by the power plant from the same amount of fuel.

In a related manner, the performance of a dry cooling system is limited by the ambient air dry-bulb temperature because all of the heat rejection in a dry cooling system is attributable to sensible heating of the surrounding air. Since dry-bulb temperatures are higher than corresponding wet-bulb temperatures, the performance of dry cooling systems will be less than wet systems (either once-through or recirculating). In fact, a recent analysis of cooling system options for combined-cycle power plants found that at nearly all locations and under nearly all climatic conditions in the United States, the performance of a properly designed and operated recirculating cooling system would be superior to a comparable direct-dry cooling system (Burns and Micheletti 2000).2001). Therefore, switching a once-through cooling system to a dry cooling system would mean that the decline in power

generation for a given amount of fuel would be even greater than for a once-through to a recirculating wet cooling system retrofit.

Veil et al. (1992) summarized literature values for the energy penalty associated with retrofitting once-through cooled plants with wet-cooling towers. The majority of the data points for the energy penalty for fossil-fueled plants were clustered in a band between 1.5 percent to 2.5 percent. Results for nuclear power plants show greater variability, ranging between 1 percent and 5.8 percent. The data points were not as clearly clustered in a narrow range as were the data points for the fossil plants. Veil et al. (1992) selected a range of 2 percent to 3 percent for the decrease in net electrical power that could be experienced if existing nuclear power plants retrofit from once-through to wet cooling.

In a more recent study, Burns and Micheletti (2000) estimate the maximum energy penalty values for a new generic 750-MW combined-cycle power plant using either a wet recirculating cooling system or a direct dry cooling system at sites in five different parts of the country. In this study, the energy penalty is defined as the loss of electricity generating capacity incurred when a cooling system is unable to perform at design efficiency. Then for both types of cooling systems, the maximum energy penalty occurs during the hottest times of the year when ambient wet-bulb and dry-bulb temperatures are greatest. This period normally is represented by 1 percent of the time during the four warmest months, which also happen to coincide with the times of national peak electricity demand. For

recirculated wet cooling, the estimated maximum energy penalty was less than 1 percent for any of the five sites. For direct dry cooling, the estimated maximum penalty ranged from 11.6 percent to 18.1 percent, depending on site climatic conditions. Although the estimates prepared by Burns and Micheletti indicate a dramatic difference in the maximum energy penalties expected from using wet and dry cooling systems, the results are not directly comparable to this study for two reasons. First, the Burns and Micheletti estimates were based exclusively on new cooling systems for new plants and did not consider any of the retrofit complexities associated with an existing once-through cooling system at an existing plant. Second, the Burns and Micheletti estimates were based on a direct-dry cooling system, while an indirect dry cooling system would be a more suitable retrofit option for an existing once-through cooling system (see subsequent discussion in Section 5.3).

For its 316(b) regulation development, EPA researched and derived energy penalty estimates based on empirical data and proven theoretical concepts for a variety of conditions (EPA 2002). To estimate nationally representative energy penalties, EPA sought data to estimate representative regions. These four regions include Northeast (Boston, MA), Southeast (Jacksonville, FL), Midwest (Chicago, IL) and Northwest (Seattle, WA). The Agency calculated the turbine component of the energy penalty by examining the empirical effect on net plant heat rates resulting from changing turbine exhaust pressures for fossil-fueled, combined-cycle, and nuclear plants. The

Agency related the turbine exhaust pressure to ambient conditions for the selected locations. Because the source water temperature for once-through cooling systems and the ambient wet bulb and dry bulb temperatures for cooling towers varies with location and time of year the Agency used empirical coastal water temperatures at the four selected locations.

For calculation of monthly average wet and dry bulb temperatures, EPA calculated time-weighted averages during the daytime period between 8 AM and 4 PM. Since the energy penalty will vary over time as ambient climatic and source water temperatures vary, the calculation of the total annual energy penalty for a chosen location integrated the results of individual calculations performed on a periodic, monthly basis. EPA used design temperatures to calculate peak-summer penalties for the selected locations based on the temperature that ambient conditions equaled or exceeded one percent of the time.

EPA derived the turbine exhaust pressure values for alternative cooling system scenarios in conjunction with the empirical temperature values. EPA used these turbine exhaust pressure values to estimate the associated change in turbine efficiency. EPA then calculated either the peak-summer (design) or the monthly energy penalty. Annual values were calculated by averaging the 12 monthly values. The annual average energy penalty values for fossil-fueled plants at the four regional sites ranged from 1.5 to 1.8 percent and the peak-summer energy penalties ranged from 1.4 to 2.0 percent.

It should be noted that EPA's annual average energy penalties were based on assuming that plants operate at just 67 percent of maximum load. The DOE does not agree with this assumption for base load plants and has brought this to EPA's attention. Subsequently, EPA estimated a 1.1% annual energy penalty based on assuming that plants operated at 100 percent of the maximum load.

The annual average penalties presented in Chapter 8 of this report are similar to those calculated by EPA, but the EPA estimates of peak summer energy penalties are considerably lower than those presented in Chapter 7 of this report. The reasons for this discrepancy are:

- EPA does not include all the pumping costs associated with a wet tower retrofit. The additional pumping costs could add approximately 0.2 to 0.7 percent to EPA's energy penalty estimates.

- EPA uses a range assumption at or near 20 degrees, which is higher than that used in most of the DOE model runs. Those runs were based on actual temperature data provided by EPA for each of the model locations (see descriptions in Chapter 7). If a 15-degree range were used, the energy penalty would increase by about 0.5 percent.

- EPA's analysis assumes that the condenser duty is the same when converting from once-through cooling to wet cooling

towers. DOE estimates that this could result in a maximum additional penalty of 0.5 percent.

Adding the contributions from these three items yield a possible increase in the EPA peak energy penalty of 1.0 to 1.5 percent and a revised EPA peak energy penalty of 2.7 to 3.2 percent for conversion to wet towers. These revisions to the EPA analysis to adjust to similar basis with this study shows approximate agreement to the DOE results.

[comment continued in 316bEFR.0 10. 102]

EPA Response

No response is required for this comment as DOE is a Federal partner in the rulemaking.

Comment ID 316bEFR.011.004

Subject Matter Code	18.01
RFC: Definition of "adverse environmental impact"	

Author Name Christine Martin

Organization PA Dept of Environmental Protection

[A] definition of "adverse environmental impact" (AEI) focused on overall environmental protection is necessary to provide the flexibility needed to achieve the best environmental outcome in individual cases. PA DEP generally supports using biological assessment approaches to determining the ecological and/or community or populational impacts that may be related to adverse environmental impacts which are associated with the impingement and/or entrainment by a cooling water intake structure. This follows the approach PA DEP uses in assessing environmental impacts of thermal discharges under Section 316(a) of the CWA. The Section 316(a) provisions are intended to "assure the protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife in and on that body of water;" and would be workable and consistent with federal and state goals of ensuring adequate protection to aquatic resources. PA DEP, however, fully recognizes that determining the potential AEI that may be attributed to the cooling

water intake structure is difficult, especially in complex situations where multiple stressors may compound the observed impacts. Therefore, PA DEP would request that we remain party to EPA's on-going considerations of the definition and related methods that will identify what is considered as AEI under this rule.

EPA Response

In today's final rule, EPA has elected not to define adverse environmental impact. Consistent with the Phase I New Facility Rule, EPA believes that it is reasonable to interpret the minimization of adverse environmental impact as minimizing the loss of aquatic organisms due to impingement and entrainment. The Agency has long maintained that adverse environmental impact from cooling water intake structures must be minimized to the fullest extent practicable. The objective of section 316(b) includes population effects but is not limited to those effects. EPA has considered the consequences associated with the loss of large numbers of aquatic organisms, including impacts on the stocks of various species, loss of compensatory reserve due to the deaths of these organisms and the overall health of ecosystems. Given all of these considerations, EPA determined that there are multiple types of undesirable and unacceptable adverse environmental impacts which result from impingement and entrainment and which must be minimized. EPA has rejected all proposed alternative definitions of adverse environmental impact because they are too broad and dependent on proven damage on the community and population levels before controls on cooling water intake structures could be put in place as

the best technology available. EPA does not view adverse environmental impact as limited to demonstrated community or population level effects. Damage on the community or population level is extremely difficult to quantify and attribute to a particular cooling water intake structure given the vast number of environmental factors and anthropogenic factors which work concurrently on fisheries at that organizational level. It is difficult to isolate the effect of a single factor. Many cooling water intake structures have been in operation for decades. During these years, fish populations have been affected by other factors such as overfishing, habitat alteration and water quality changes. Because of these simultaneously-occurring factors, the determination of a change in a population that is directly attributable to the operation of a cooling water intake structure may prove to be very difficult.

Comment ID 316bEFR.029.032

Subject Matter Code	9.0
Costs	

Author Name Elise N. Zoli

Organization Godwin Proctor Counselors at Law obo Entergy Corporation

---

EPA also fails to include the significant energy penalty due to the shutdown of units during installation. The impact is particularly significant and in some cases compromising of the local electric system's reliability, if facilities shut down permanently because conversion is not economically feasible. EPA also fails to account for turbine back-pressure, which EPA concedes could significantly affect net facility capacity, see Phase II TDD Ch. 5.3, by assuming that turbine backpressure for a retrofitted facility would be the same as for a new facility with cooling towers. Impacts to system reliability and energy pricing is expected to be severe, as discussed below. Certainly, EPA's conclusion that impacts are nominal is patently erroneous, as applied to Entergy stations. See National Economic Research Associates ("NERA"), Electricity System Impacts of Nuclear Shutdown Alternatives, dated March 2002 (Appendix 6). Department of Energy (DOE), and others, concur. See Phase II TDD at 5-31 to 5-34.

By way of example, in the important peak summer period, Vermont Yankee Nuclear Power Facility sacrifices 9 megawatts to operate the cooling towers and an additional 20 megawatts due to increased condenser back pressure as a result of higher condensate temperatures. These megawatts represent 5.3% of Vermont Yankee Nuclear Station's available power. Further, this power generation represents the major source (i.e., 78%) of electric power in Vermont, with the result that impacts of any reduction would be severe for Vermont's electricity consumers.

EPA Response

EPA has considered the energy penalty issue raised by the commenter and it was one of the factors influencing EPA's decision to not base the requirements of the final rule on this technology.

Comment ID 316bEFR.075.057

Subject Matter Code	9.04
Cooling system costs (e.g., dry, wet, recirculating)	

Author Name Maureen F. Vaskis & Mark F. Strickland

Organization PSEG Services Corporation, Ofc of Environmental Counsel

---

USEPA Substantially Underestimated the Costs of Retrofitting to Closed Cycle Cooling.

USEPA cannot justify any of the closed cycle cooling alternatives based on the data and information contained in the Docket. Even though, as shown below, the costs USEPA estimated are substantially lower than estimates based upon site-specific engineering estimates for existing facilities or extrapolations based on such analyses. USEPA, in the Preamble, rightly states that it did not select a nation-wide, closed-cycle requirement (i.e., the first closed-cycle option) "because of the generally high costs of such conversions... and serious concerns about the short term energy implications of a massive concurrent conversion and the potential for supply disruptions that it would entail." <FN 59> This was the right

---

conclusion and PSEG believes it is equally applicable to the second and third closed-cycle options as well.

PSEG endorses USEPA's conclusion that the costs of retrofitting are too high, especially since USEPA substantially underestimated the costs for retrofitting existing facilities to operate with closed cycle cooling. USEPA provides the costs it relied upon to reach this conclusion in the EBA. <FN 60> USEPA estimated the total annualized cost for retrofitting all 426 power plants to be approximately 2.32 billion dollars or on average, approximately 5.45 million dollars per facility (annualized total cost). In connection with Section 316 (b) Demonstrations <FN 61> filed with the New Jersey Department of Environmental Protection ("NJDEP") between 1998 and 2001, PSEG commissioned preliminary engineering analyses and cost estimates for retrofitting three of its power plants located on estuaries or tidal rivers to operate with closed cycle cooling. These analyses were conducted for power plants that would have been within the scope of any of USEPA's three closed-cycle cooling options, and given the mix of fuel types and sizes of these plants, the cost estimates for these plants are likely to bound estimates that would be representative for a considerable range of facilities that would be affected by these options. As discussed below, Shaw Stone & Webster's report for UWAG <FN 62> corroborates PSEG's capital cost estimates for these facilities and echoes the conclusion that USEPA substantially underestimated the costs of retrofitting existing facilities for closed cycle cooling systems.

-[Footer omitted in printing.]

a. Mercer Generating Station

PSEG's Mercer Generating Station ("Mercer") consists of two coal-fired units withdrawing up to 345.6 MGD of once-through cooling water from the tidal river portion of the Delaware Estuary near Trenton, NJ. <FN 63> The present value capital cost to retrofit Mercer with wet mechanical draft cooling towers was estimated to be 55.74 million dollars. <FN 64> The total capital cost estimate presented in the Mercer C/B Analysis includes the following cost components: capital, labor and materials associated with construction and installation (Table 8-1). The PSEG total cost estimate of 55.74 million is very close to the 58.53 million estimated for Mercer Units 1 and 2 combined by Shaw Stone and Webster, Inc. <FN 65>

b. Hudson Generating Station

PSEG's Hudson Generating Station ("Hudson") consists of Units 1 and 2 that are natural gas and coal or natural gas fired units respectively. Unit 1 withdraws 388.8 mgd and Unit 2 withdraws 504.0 mgd of once-through cooling water from the estuarine reach of the Hackensack River. The total present value cost to retrofit Hudson with wet mechanical draft cooling towers was estimated to be 104.57 million dollars. <FN 66> The total capital cost estimate presented in the Hudson C/B Analysis includes the following cost components: capital, labor and materials associated with construction and installation (Table 8-1). The PSEG total cost estimate of 104.57 million dollars is the close to the 117.48 million dollars estimated for Hudson Units 1 and 2 combined in Shaw Stone and Webster Report.

[Footer omitted in printing.]

c. Salem Generating Station

PSEG's Salem Generating Station ("Salem"), a base-load nuclear facility, consists of two units <FN 67> with a combined intake flow of up to 3,024 MGD of once-through cooling water from the Delaware Estuary. <FN 68> The total present value capital cost estimate to retrofit Salem with wet mechanical draft cooling towers was 576.0 million dollars. <FN 69> The total capital cost estimate presented in Appendix F to Salem's 1999 Application is comprised of the following cost components: capital, labor and materials associated with construction and installation, (Appendix F IX Table 1). The PSEG total cost estimate of 576.0 million is close to the 593.32 million estimated for Salem Units 1 and 2 combined in Shaw Stone & Webster Report.

The total present value capital cost estimates for Mercer, Hudson and Salem were adjusted to total annualized capital costs so direct comparisons could be made to USEPA's facility cost estimate. The total annualized costs for retrofitting Mercer, Hudson, and Salem are estimated at $6.31, 8.69, and 51.07 million, respectively. <FN 70> The PSEG estimates for Mercer, Hudson, and Salem are substantially higher than USEPA's average total annualized cost estimate for an individual facility (i.e., 5.45 million in dollars). The PSEG estimates and the Shaw Stone & Webster estimates are based on preliminary engineering analyses conducted for existing facilities. USEPA, on the other hand, developed its estimates by extrapolating from its estimate of the costs associated with installing cooling towers at a new facility. It

clearly stands to reason that the PSEG and UWAG estimates of substantially greater costs are more reliable. Also, the differences between the PSEG and Shaw Stone & Webster's estimate as compared to USEPA estimates indicate that consideration of site-specific factors are extremely important in providing realistic cost estimates for retrofitting existing facilities with mechanical draft cooling towers.

In short, USEPA has substantially underestimated the costs that would be borne by society if a closed-cycle cooling alternative were adopted. Even using these substantial under-estimates, the Agency rightfully determined that the costs would outweigh any benefits that might result. Even the inclusion of provisions, whereby permittees could have (1) implemented restoration measures in lieu of retrofitting upon a demonstration of comparable performance or (2) petitioned for less stringent requirements if certain tests could be met <FN 71> would be insufficient to overcome the fundamental flaw caused by the substantial underestimation of costs.

Footnotes

59 67 Fed. Reg. 17122, 17155, col. 1 and 2.

60 EBA, p. B7-9.

61 Public Service Electric and Gas Company (PSEG). Hudson Generating Station Supplemental 316(b) Report, Chapter 8, "Costs and Benefits of Alternatives for Modifying Cooling Water Intakes", November 1998 ("Hudson C/B Analyis"); Public Service Electric and Gas Company (PSEG). Renewal Application Salem

Generating Station NJPDES Permit No. NJ0005622. Appendix F: Clean Water Act Section 316(b) Demonstration, Section IX, "Costs and Benefits of Fish Protection Alternatives", Volume 14 of 36, March 4, 1999; PSEG Fossil LLC (PSEG) ("Appendix F to Salem's 1999 Application"); Mercer Generating Station 316(b) Demonstration. Chapter 8, "Costs and Benefits", November 2001 ("Mercer C/B Analysis").

62 Shaw Stone & Webster, Inc., Engineering Cost Estimate for Retrofitting Closed-Cycle Cooling Systems at Existing Facilities, Appendix 15 to UWAG Phase II comments Prepared for the Utility Water Act Group ("Shaw Stone & Webster Report") (2002).

63 Mercer C/B Analysis, supra.

64 All Mercer cost estimates are present values as of January 1, 2002, in millions of 2000 dollars.

65 UWAG's Phase II Comments, Appendix 15, Cost of Retrofitting Cooling Towners at Existing U.S. Power Plants ("UWAG – Appendix 15").

66 All Hudson cost estimates are present values as of January 1, 2000, in millions of 1997 dollars.

67 Appendix F to Salem's 1999 Application.

68 PSEG had also commissioned Stone & Webster Engineering Corporation ("SWEC") to perform a preliminary engineering analysis and cost estimate for retrofitting Salem in 1990, which were updated in 1993 and again in 1999. In 1993, at the request of the NJDEP, PSEG hired a second firm, Sargent & Lundy

("S&L") to conduct a validation and verification of SWEC's work product. S&L confirmed that SWEC's design approach and cost estimates were reasonable and appropriate. S&L concluded that SWEC's engineering analysis and their cost estimates associated with the closed-cycle cooling retrofit were reasonable and consistent with sound engineering practice (Appendix F to Salem's 1999 Application, Section VIII). In 1999, SWEC reconfirmed the conclusions reached in 1990 and 1993 that retrofitting Salem with a closed-cycle cooling system would require an unprecedented and complex construction effort (Appendix F to Salem's 1999 Application, Attachment 7).

69 All Salem cost estimates are present values as of January 1, 2001, in millions of 1998 dollars.

70 The Mercer estimate assumed a 7% discount rate with construction starting in 2002 and costs extending through 2015; the Hudson estimate assumed a 5.78% discount rate with construction starting in 2000 and costs extending through 2022; and the Salem estimate assumed a 6.19% discount rate with construction starting in 2001 and costs extending through 2021(All values are 2001 dollars).

71 See, 67 Fed. Reg. 17154 col. 1 and 2, Section VI.B.

EPA Response

See response to comment 316b.EFR.208.002.

Comment ID 316bEFR.306.116

Subject Matter Code	21.04
Determination of compliance	

Author Name Doug Dixon & Kent Zammit

Organization EPRI

Additional Comments

Site-specific variability in the physical sciences and biology, CWIS operation, and performance of fish protection technologies, as we have long noted in our comments and reports, indicates the importance of providing flexibility in the determination of the species and metrics to be used during both baseline characterization and technology performance assessment. The following additional points are noted for consideration relative to providing flexibility in determining technology performance or in setting standards of performance:

- Exclusion of fish that are moribund or dead on arrival, as discussed in the NODA, is notable and logical. CWIS will act as 'filters' and collect moribund and dead fish that occur in the water due to natural causes (e.g., cold shock, low dissolved oxygen) and these organisms should be excluded from performance assessments. Not only should they be excluded, the technology

should not be expected to perform at 'normal' standards because of clogging of screens, fish return troughs, etc. Essentially, expectation of technology performance to 'target' standards should not be expected during episodic fish kills. Standards for determining/identifying moribund and dead fish can be ascertained on a site-specific basis.

EPA Response

With regard to EPA's approach to the exclusion of moribund or dead organisms from determining compliance, it is generally EPA's position that naturally dead or moribund organisms should not be factored into the impingement or entrainment rates of a facility. However, EPA has left the final determination on methodology employed to the Director. EPA has included a provision in the Verification Monitoring Plan which allows a facility to exclude moribund or dead organisms. The facility may submit a proposal the Director as part of the Verification Monitoring Plan, that details how naturally moribund fish and shellfish that enter the cooling water intake structure would be identified and taken into account in determining compliance with the performance standards in § 125.94.

Comment ID – 316bEFR.317.013

Subject Matter Code	6.03
Impacts of CWIS on impaired waterbodies	

Author Name	Basil G. Constantelos
Organization	Midwest Generation EME, LLC

Waterbody-Specific Protection is Warranted

Equal protection is not required for every waterbody in Illinois, as evidenced by the fact that a significant portion of the waterways located in the Chicago area are designated as Secondary Contact and Indigenous Aquatic Life waters, due to their inability to meet the fishable / swimmable" standards required by the Clean Water Act. These waterways have been either created or significantly altered by human disturbances for more than one hundred years, and function largely as conveyances for treated effluents and barge transport, while still supporting a fair assemblage of aquatic organisms which are suited to this particular environment. The types of species expected to be entrained and/or impinged by power plants on these waterways are largely rough, low quality fish such as common carp, buffalo and gizzard shad, in addition to the invasive species noted above. These species are

not "valued" (within the meaning of EPA's economic analysis) and do not warrant the same kind of protection as more desirable or ecologically important species, such as game fish, threatened or endangered species or other species important to the support of the food chain and/or recreational industry in any particular waterway. State natural resources management agencies have long been allowed to give greater protection to those waterbodies which can support the greatest diversity of quality aquatic species. This is another important example of why flexibility is required to allow the States to direct their limited resources to the protection of the most ecologically important waterways. The proposed 316(b) rule, as presently written, will result in the broad application of uniform controls for waterbodies without the necessary consideration of whether a comparable environmental benefit is attainable.

EPA Response

In order for species to coexist in a given area and utilize the same resources, they must occupy a separate and distinct niche. EPA believes all species native to given waterbody warrant the same level of protection. Although the author may consider common carp, buffalo and gizzard shad to be "rough, low quality fish", their presence in the waterbody indicates they do occupy a distinct niche and contribute to the food chain in the ecosystem. That said, EPA believes today's final rule allows ample flexibility for the States to set their own priorities.